ACORN·USER

BBC MICRO·ELECTRON·ATOM

AUGUST 1984 £1

Satellite link: watch the weather on your BBC micro

Electron: learn to use your keyboard

Listings: how to find and correct errors

Music: a trio of tunes to type in and play

MICROTOTS
TEACHING YOUNGSTERS WITH A MICRO

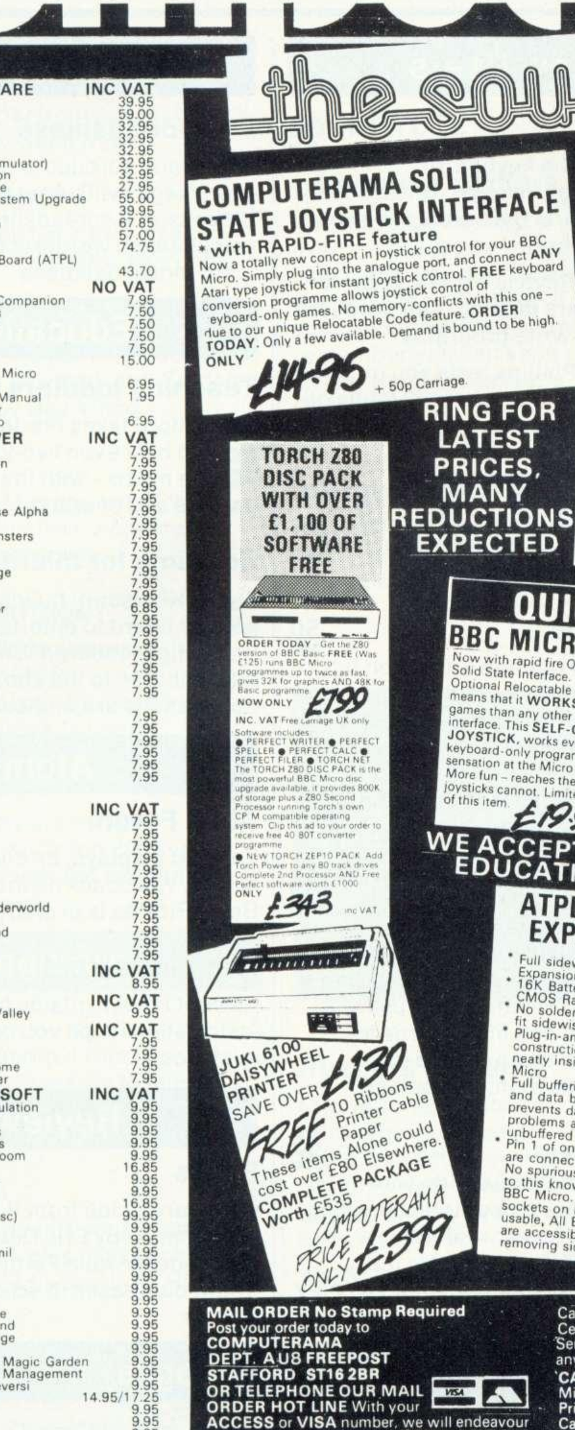
Competition: 5 Torch communication systems to be won. Each worth £180

Computerama

the source



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Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text, with diagrams on separate sheets. Please enclose programs on disc or cassette, with a listing if possible. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything. Please include a suitable stamped, addressed envelope for return. Articles are acknowledged on receipt.

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New Users

Business

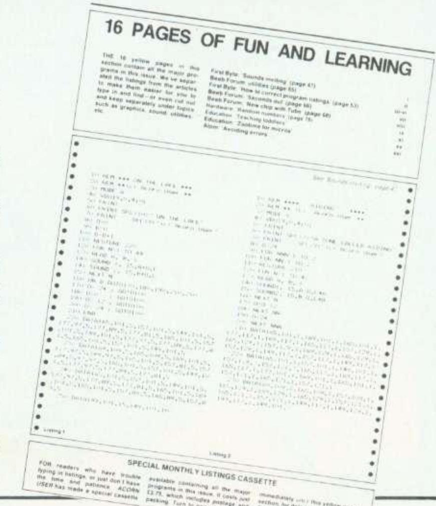
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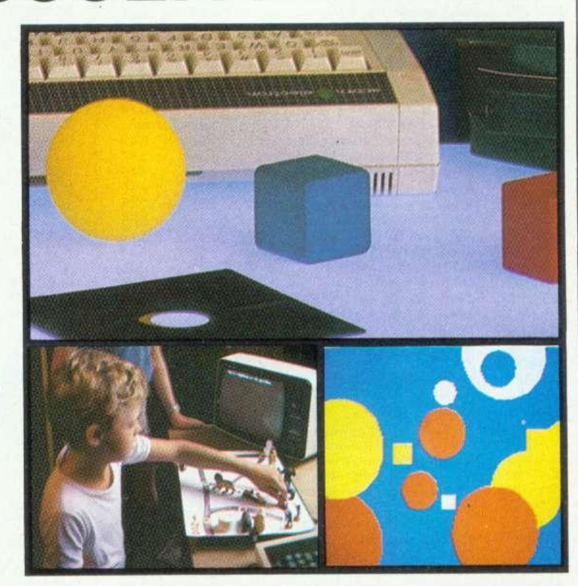
Atom

Reviews

Yellow listing pages

An extra 16-page section devoted solely to the major program listings in this issue





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MODE CHOICE....ENTER 1 for four colour
picture,       ENTER 2 for distortion
corrected eight colour picture
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:WHITE (grey scale) ENTER 1
BLACK:MAGENTA:RED:YELLOW:GREEN:BLUE:CYAN
:WHITE (thermal scale) ENTER 2
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For South to North pass ENTER 2
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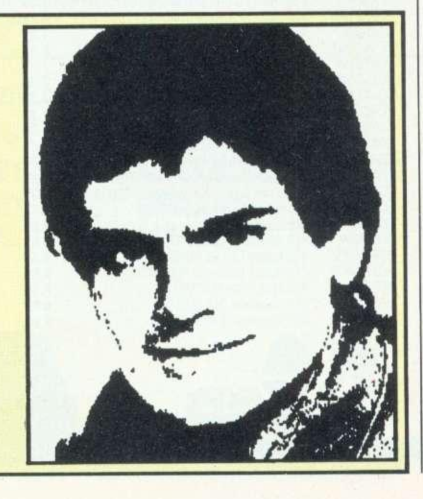

NEXT MONTH. . .

Muscle in on the airwaves
Tune in to RTTY and the dots, dashes and bleeps of short wave radio

Super plotting
The Parfitt plotter is soon to have a scriber, opto sensor (which digitised the image here), drill and special software added. We take a sneak preview

Unicorn review
Torch offers a 10Mb hard disc, floppy disc and Unix on the 68000 chip in its top-of-the-range Unicorn. We take a critical look

PLUS – May competition results



Electronequip

(Authorised BBC Dealer, and service centre)

	BBC Cassette Software	Exc VAT	Inc VAT
BCADFOOT	Addictive Football Manager	5.87	6.75
BCAFBOUN	A & F Software Bouncer	5.92	6.80
BCAFCHIC	A & F Software Chuckie Egg	5.84	6.72
BCAFCYLO	A & F Software Cylon Attack	5.84	6.72
BCAFFROG	A & F Software Frogger	5.92	6.80
BCAFHORR	A & F Software Horror Castle	5.92	6.80
BCAFHOWS	A & F Software Howszat	5.10	5.87
BCAFPAIN	A & F Software Painter	5.92	6.80
BCAFPHAR	A & F Software Pharaohs Tomb	5.92	6.80
BCAFPLAN	A & F Software Planes	5.92	6.80
BCAFSHRI	A & F Software Shrinking Professor	5.92	6.80
BCAIADVE	Adventure International Adventureland	7.35	8.46
BCAIPIRA	Adventure International Pirate Adventure	7.35	8.46
BCAISECR	Adventure International Secret Mission	7.35	8.46
BCAIVOOD	Adventure International Voodoo Castle	7.35	8.46
BCAKCHIL	ASK Children from Space (XBE16)	7.35	8.46
BCAKCRAN	ASK Cranky (XBE17)	7.35	8.46
BCAKFACE	ASK Facemaker (XBE10)	7.35	8.46
BCAKHIDE	ASK Hide & Seek (XBE11)	7.35	8.46
BCAKLETS	ASK Let's Count (XBE12)	7.35	8.46
BCAKNUMC	ASK Number Chaser (XBE15)	7.35	8.46
BCAKNUMG	ASK Number Gulper (XBR13)	5.82	6.70
BCAKNUMP	ASK Number Puzzler (XBE14)	7.35	8.46
BCAKTABL	ASK Table Adventures (XBE18)	7.35	8.46
BCAKWORD	ASK Words, Words, Words (XBE19)	7.35	8.46
BCALABM	Alligata Software ABM (Laser Command)	4.39	5.05
BCALBLAG	Alligata Software Blagger	6.61	7.60
BCALBUGB	Alligata Software Bug Blaster	5.88	6.76
BCALCOSM	Alligata Software Cosmic Asteroids	4.39	5.05
BCALDAMB	Alligata Software Dambusters	5.87	6.75
BCALEAGL	Alligata Software Eagle Empire	5.87	6.75
BCALFRUI	Alligata Software Fruit Machine (B006)	4.39	5.05
BCALLUNA	Alligata Software Lunar Rescue (B007)	5.87	6.75
BCAMALGE	Ampalsoft Cheshire Cat Algebra O level	5.13	5.90
BCAMARIT	Ampalsoft Cheshire Cat Arithmetic O level	5.13	5.90
BCAMCALC	Ampalsoft Cheshire Cat Calculus O level	5.13	5.90
BCAMCONS	Ampalsoft Cheshire Cat Construction "O"	5.13	5.90
BCAMGRAP	Ampalsoft Cheshire Cat Graphs O level	5.13	5.90
BCAMMAT1	Ampalsoft Cheshire Cat Maths "O" level 1	11.05	12.71
BCAMMAT2	Ampalsoft Cheshire Cat Maths "O" level 2	11.05	12.71
BCAMTRIG	Ampalsoft Cheshire Cat Trigonometry "O"	5.13	5.90
BCAS100P	Acornsoft 100 Programs for BBC Micro	8.50	9.78
BCASAACT	Acornsoft Arcade Action (SBG06)	8.80	10.12
BCASARCA	Acornsoft Arcadians (SBG14)	7.35	8.46
BCASAVIA	Acornsoft Aviator flight simulator SBG02	11.05	12.71
BCASBUSI	Acornsoft Business Games (SBE03)	7.35	8.46
BCASCARO	Acornsoft Carousel (SBG24)	7.35	8.46
BCASCAST	Acornsoft Castle of Riddles (SBG17)	7.35	8.46
BCASCHAN	Acornsoft Chemical Analysis (SBE12)	10.20	11.73
BCASCHES	Acornsoft Chess (SBG10)	7.35	8.46
BCASCHSI	Acornsoft Chemical Simulations (SBE13)	10.20	11.73
BCASCHST	Acornsoft Chemical Structures (SBE14)	10.20	11.73
BCASCOLL	Acornsoft/ICL Collectors Cat. SBX05	7.35	8.46
BCASCOUN	Acornsoft Countdown to Doom (SBG19)	7.35	8.46
BCASCRAZ	Acornsoft Crazy Tracer (SBG26) (B)	7.35	8.46
BCASCREA	Acornsoft Creative Graphics (SBX01)	7.35	8.46
BCASDESK	Acornsoft Desk Diary (SBB01)	7.35	8.46
BCASDRAU	Acornsoft Draughts & Reversi (B) (SBG20)	7.35	8.46
BCASEXAM	Acornsoft Examiner Cassette (SBE17) (B)	7.35	8.46
BCASFORE	Acornsoft Forecast (SBB02)	8.80	10.12
BCASFORT	Acornsoft Forth Cassette (SBL01)	12.45	14.32
BCASFREE	Acornsoft Free Fall (SBG28)	7.35	8.46
BCASFREN	Acornsoft French (Linkword) (SBX13)	11.05	12.71
BCASGERM	Acornsoft German (Linkword) (SBX16)	11.05	12.71
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BCASHOOK	A'soft/ICL Hooked on Numbers (SBX08)	7.35	8.46
BCASHOPP	Acornsoft Hopper (SBG23)	7.35	8.46
BCASITAL	Acornsoft Italian (Linkword) (SBX14)	11.05	12.71
BCASJARS	Acornsoft Jars (SBE15)	8.83	10.16
BCASJCBD	Acornsoft JCB Digger (SBG09)	7.35	8.46
BCASLISD	Acornsoft Lisp Demo Progs SBL09	7.35	8.46
BCASLISP	Acornsoft Lisp Cassette (SBL02)	12.45	14.32
BCASMAGI	Acornsoft Magic Garden (B) (SBX04)	7.35	8.46
BCASMEMB	Acornsoft/ICL M'ship Manager (SBX06)	7.35	8.46
BCASMETE	Acornsoft Meteors (SBG13)	7.35	8.46
BCASMICR	Acornsoft Microtext (SBL04)	36.85	42.37
BCASMISB	Acornsoft Missile Base (SBG18)	7.35	8.46
BCASMISS	Acornsoft Missing Signs (SBE09)	8.83	10.16
BCASMONS	Acornsoft Monsters (SBG03)	7.35	8.46
BCASNUMB	Acornsoft Number Balance (SBE08)	8.83	10.16
BCASONET	Acornsoft/ICL One to Nine (SBX07)	7.35	8.46
BCASPEEK	Acornsoft Peeko-Computer Pack (SBE02)	7.35	8.46
BCASPERS	Acornsoft Personal Money M'ment SBB5	8.80	10.12
BCASPHIL	Acornsoft Philosophers Quest (SBG01)	7.35	8.46
BCASPICT	Acornsoft Picture Maker (SBX03)	7.35	8.46
BCASPLAN	Acornsoft Planetoid (Defender) (SBG15)	7.35	8.46
BCASROCK	Acornsoft Rocket Raid (SBG05)	7.35	8.46
BCASSENT	Acornsoft Sentence Sequencing (SBE07)	8.83	10.16
BCASSINV	Acornsoft Super Invaders (SBG16)	7.35	8.46
BCASSLID	Acornsoft Sliding block puzzles (SBG12)	7.35	8.46
BCASSNAP	Acornsoft Snapper (SBG04)	7.35	8.46
BCASSNOO	Acornsoft Snooker (SBG21)	7.35	8.46
BCASSPAN	Acornsoft Spanish (Linkword) (SBX15)	11.05	12.71
BCASSPAS	Acornsoft S Pascal (SBL08)	12.45	14.32
BCASSPHI	Acornsoft Sphinx Adventure (SBG07)	7.35	8.46
BCASSTAR	Acornsoft Starship Command (SBG22)	7.35	8.46
BCASTREE	Acornsoft Tree of Knowledge (SBE04)	7.35	8.46
BCASWORH	Acornsoft Word Hunt (SBE05)	8.83	10.16
BCASWORS	Acornsoft Word Sequencing (SBE06)	8.83	10.16
BCBEAVM	BES Animal Vegetable Mineral (XBE03)	6.63	7.62
BCBEHAPL	BES Happy Letters (XBE07)	6.63	7.62
BCBEHAPN	BES Happy Numbers (XBE04)	6.63	7.62
BCBEMAPR	BES Map Rally (XBE08)	6.63	7.62
BCBETIM1	BES Timeman One (XBE05)	6.63	7.62
BCBETIM2	BES Timeman Two (XBE06)	6.63	7.62

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BCBEWORH	BES Wordhang (XBE02)	6.63	7.62
BCBEWORW	BES World-Wise (XBE01)	6.63	7.62
BCBSBEYO	BBCsoft Beyond Basic Cassette (B)	8.50	9.78
BCBSCANY	BBCsoft Canyon (B)	7.39	8.50
BCBSDRAW	BBCsoft Drawing	7.40	8.50
BCBSDRWH	BBCsoft Dr Who: The First Adventure (B)	7.39	8.50
BCBSEARL	BBCsoft Early Learning	7.40	8.50
BCBSFUNG	BBCsoft Fun Games	7.40	8.50
BCBSGAMS	BBCsoft Games of Strategy	7.40	8.50
BCBSHOMF	BBCsoft Home Finance	7.40	8.50
BCBSMAKM	Making the most of your Micro (Inc book)	9.57	11.01
BCBSMOTO	BBCsoft Motorists' Log	7.40	8.50
BCBSMUSI	BBCsoft Music	7.40	8.50
BCBSPAIN	BBCsoft Painting	7.40	8.50
BCBSPRO1	BBCsoft Programs Vol 1	7.40	8.50
BCBSPRO2	BBCsoft Programs Vol 2	7.40	8.50
BCBSRECO	BBCsoft Record Keeper (B)	10.20	11.73
BCBSTAXC	BBCsoft Taxcalc (B)	8.16	9.38
BCBSTOOL	BBCsoft Tool Box (B)	15.52	17.85
BCBSVUTY	BBCsoft VU Type (Typing Tutor) (B)	11.90	13.69
BCBSWHIT	BBCsoft White Knight Mark Eleven (B)	8.50	9.78
BCBUTWIN	Bug-Byte Twin Kingdom Valley	7.02	8.07
BCCCANDR	Computer Concepts Android Attack	6.61	7.60
BCCCASTE	Computer Concepts Asteroid belt	5.87	6.75
BCCCCHES	Computer Concepts Chess	6.61	7.60
BCCCGAME	Computer Concepts Games Galore 1	6.61	7.60
BCCCHITC	Computer Concepts Hitch Hiker	4.93	5.67
BCCCLOGO	Computer Concepts Logo II	8.50	9.78
BCCCSNAK	Computer Concepts Snake	5.87	6.75
BCCCSPAC	Computer Concepts Spacehawks	5.87	6.75
BCCCSWAR	Computer Côncepts Swarm	6.61	7.60
BCDASUPE	DACC Super-7 (Arcade games compend.)	6.61	7.60
BCDS747	Doctor Soft 747	5.87	6.75
BCFBSPAD	First Byte Space Adventure One	5.87	6.75
BCFBSTFO	First Byte Star-Force Lander	5.14	5.91
BCFBSTTR	First Byte Star Trader	5.87	6.75
BCFBVAPH	First Byte Valley of the Pharoahs	5.87	6.75
BCGACHEE	Garland Software Chemical Equatons	9.57	11.01
BCGACHEI	Garland S'ware Chemistry Inorganic Ana	9.57	11.01
BCGACHES	Garland S'ware Chemistry Symbol/For/Va	9.57	11.01
BCGAHUMA	Garland S'ware Human Body Heart & Kid	9.57	11.01
BCGAPHYC	Garland S'ware Physics Cathode Ray Osc	9.57	11.01
BCGEBEEB	Gemini Beebcalc (Spreadsheet)	14.75	16.96
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BCGEFINA	Gemini Final Accounts	44.31	50.96
BCGEHOMA	Gemini Home Accounts	14.75	16.96
BCGEINVS	Gemini Invstat (Invoices & Statements)	14.75	16.96
BCGELIBE	Gemini Liberator	7.35	8.46
BCGEMAIL	Gemini Mail List	14.75	16.96
BCGEMISS	Gemini Missile Control	7.35	8.46
BCGEPAYR	Gemini Payroll	29.53	33.96
BCGESLEI	Gemini Sleighbells	7.35	8.46
BCGESTOC	Gemini Stock Control (ICS)	14.75	16.96
BCGETRAD	Gemini Traditional Games (B) (E)	11.05	12.71
BCGEWORD	Gemini Word Processor	14.75	16.96
BCGGFAIR	Griffin & George Fairshare	7.35	8.46
BCGGGETS	Griffin & George Getset	7.35	8.46
BCGGNUMB	Griffin & George Numberfun	7.35	8.46
BCGGTABL	Griffin & George Tablesums	7.35	8.46
BCGGWORG	Griffin & George Wordgames	7.35	8.46
BCGGWORS	Griffin & George Wordspell	7.35	8.46
BCGHTALP	Good Houseke'g Mr T's Alphabet	9.57	11.01
BCGHTMEA	Good Houseke'g Mr T's Measuring Games	9.57	11.01
BCGHTMON	Good Houseke'g Mr T's Money Box	9.57	11.01
BCGHTNUM	Good Houseke'g Mr T's Number Games	9.57	11.01
BCGHTSHA	Good Houseke'g Mr T's Shape Game	9.57	11.01
BCGHTTEL	Good Houseke'g Mr T Tells the Time	9.57	11.01
BCGRMINE	Graphic Research Minefield	5.13	5.90
BCGRORBI	Graphic Research Orbit O	7.35	8.46
BCHOADVB	Honeyfold Advanced Basic course	12.10	12.71
BCHOBEGA	Honeyfold Beginners Assembly Language	12.10	12.71
BCHOBEGB	Honeyfold Beginners Basic course	12.10	12.71
BCHSPENG	H. Soft Penguin	6.59	7.58
BCIBCRIM	Ivan Berg Crime & Detection Quiz (XBX02)	9.35	10.75
BCIBDATI	Ivan Berg Dating Game (XBX08)	9.35	10.75
BCIBHIST	Ivan Berg History Quiz (XBX04)	9.35	10.75
BCIBIDO	Ivan Berg 'I Do' (XBX07)	9.35	10.75
BCIBMUSI	Ivan Berg Music Quiz (XBX03)	9.35	10.75
BCIBROYA	Ivan Berg Royalty Quiz (XBX06)	9.35	10.75
BCIBSCIE	Ivan Berg Science Fiction Quiz (XBX05)	9.35	10.75
BCIBTHER	Ivan Berg Theatre Quiz (XBX01)	9.35	10.75
BCIJ3DMA	IJK 3D Maze for BBC (7)	3.32	3.82
BCIJFLAG	IJK Flags for BBC (12)	3.32	3.82
BCIJHYPE	IJK Hyperdrive for BBC (13)	4.80	5.52
BCIJINVA	IJK Invaders for BBC (9)	5.54	6.37
BCIJSTRA	IJK Stratobomber for BBC (14)	5.54	6.37
BCJOYSTI	Joystick Utility program for BBC	5.06	5.82
BCKAGALA	Kansas Galactic Firebird	7.01	8.06
BCKAPINB	Kansas Pinball Arcade	7.01	8.06
BCKDPASS	Kay Dee Software Pass Go	7.23	8.31
BCKOFREA	Kosmos Software French Mistress A	7.35	8.46
BCKOFREB	Kosmos Software French Mistress B	7.35	8.46
BCKOGERA	Kosmos Software German Master A	7.35	8.46
BCKOGERB	Kosmos Software German Master B	7.35	8.46
BCKOSPAA	Kosmos Software Spanish Tutor A	7.35	8.46
BCKOSPAB	Kosmos Software Spanish Tutor B	7.35	8.46
BCL9COLO	Level 9 Colossal Adventure (B)	7.32	8.42
BCL9DUNG	Level 9 Dungeons (B)	7.32	8.42
BCL9LORD	Level 9 Lords of Time (b)	7.32	8.42
BCL9SNOW	Level 9 Snowball (B)	7.32	8.42
BCMHHOBB	Melbourne House Hobbit	11.05	12.71
BCMSFIRS	Mirrorsoft First Steps with the Mr. Men	6.61	7.60

	BBC Cassette Software	Exc VAT	Inc VAT
BCMSQUIC	Mirrorsoft Quick Thinking (B)	5.13	5.90
BCOCMRWI	Ocean Mr. Wimpy	5.10	5.87
BCPAFORT	Pace Software Fortress	6.61	7.60
BCPPADVE	Program Power Adventure (B)	5.87	6.75
BCPPALID	Program Power Alien Destroyers (Invader)	5.91	6.79
BCPPALIE	Program Power Alien Swirl	5.13	5.90
BCPPASTE	Program Power Asteroid Storm (B)	5.87	6.75
BCPPASTR	Program Power Astro Navigator	4.21	4.84
BCPPBAND	Program Power Bandits at 3 o'clock	5.14	5.91
BCPPBARR	Program Power Barrage for BBC	5.13	5.90
BCPPBEEB	Program Power Beeb-Tote (B)	4.40	5.06
BCPPBUMB	Program Power Bumble Bee (B)	5.87	6.75
BCPPCAVA	Program Power Caveman Adventure	5.06	5.82
BCPPCH16	Program Power BBC Chess (16K)	3.66	4.20
BCPPCHEM	Program Power Chemistry	5.13	5.90
BCPPCHES	Program Power Chess	5.87	6.75
BCPPCONS	Program Power Constellation	5.87	6.75
BCPPCOSM	Program Power Cosmic Combat (B)	5.14	5.91
BCPPCOWB	Program Power Cowboy Shoot-out	5.06	5.82
BCPPCROA	Program Power Croaker	5.87	6.75
BCPPCYBE	Program Power Cybertron Mission (B)	5.87	6.75
BCPPDANG	Program Power Danger! UXB	5.87	6.75
BCPPDEMO	Program Power Demon Decorator (Painter)	5.06	5.82
BCPPDIS	Program Power BBC Disassembler	5.06	5.82
BCPPELDO	Program Power Eldorado Gold (Adventure)	5.06	5.82
BCPPESCA	Program Power Escape from M'base Alpha	5.87	6.75
BCPPFFAC	Program Power Felix in the Factory	5.87	6.75
BCPPFFRU	Program Power Felix & the Fruit Monsters	5.87	6.75
BCPPFOOT	Program Power Footer	5.87	6.75
BCPPGALA	Program Power Galactic Commander	5.87	6.75
BCPPGHOU	Program Power Ghouls	5.87	6.75
BCPPHELL	Program Power Hell Driver (B)	5.87	6.75
BCPPINTE	Program Power Intergalactic Trader (B)	6.61	7.60
BCPPJETP	Program Power Jet Power Jack	5.87	6.75
BCPPKILL	Program Power Killer Gorilla	5.87	6.75
BCPPLABC	Program Power Labyrinths of la Coshe	5.87	6.75
BCPPLASE	Program Power Laser Command	5.87	6.75
BCPPMART	Program Power Martian Attack (B)	5.87	6.75
BCPPMASM	Program Power Mastermind for BBC	3.36	3.86
BCPPMAZE	Program Power Maze Invaders (B)	4.40	5.06
BCPPMINE	Program Power Mine (B)	5.87	6.75
BCPPMOON	Program Power Moon Raider	5.87	6.75
BCPPNEME	Program Power Nemesis (B)	5.87	6.75
BCPPPOKE	Program Power Poker Dice (B)	4.40	5.06
BCPPPOSI	Program Power Positron (B)	5.14	5.91
BCPPREV2	Program Power Reversi (32K)	4.21	4.84
BCPPROUL	Program Power Roulette for BBC	4.21	4.84
BCPPSEEK	Program Power Seek	5.06	5.82
BCPPSPAC	Program Power Space Jailer (B)	5.14	5.91
BCPPSTAR	Program Power Startrek	4.21	4.84
BCPPSWOO	Program Power Swoop	5.87	6.75
BCPPTIMT	Program Power Timetrek (Startrek Plus)	5.87	6.75
BCPPWALL	Program Power Wall (B)	4.40	5.06
BCPPWHER	Program Power Where (B)	5.14	5.91
BCPPWHIC	Program Power Wich Salt?	5.14	5.91
BCPPWORL	Program Power World Geography (B)	5.14	5.91
BCPPZARM	Program Power Zarm (B)	5.87	6.75
BCPSSALO	Psion Saloon Sally	4.39	5.05
BCPSVUCA	Psion VU Calc	11.05	12.71
BSQSBEEB	Quicksilva Beeb Art (B)	11.05	12.71
BCQSGENE	Quicksilva Generator (B)	5.13	5.90
BCQSMUSI	Quicksilva Music Processor (B)	11.05	12.71
BCRHGALA	RH Software Galactic Wipeout (RHS001C)	6.61	7.60
BCRHSKIS	RH Software Ski Slalom (RHS002C)	6.61	7.60
BCSHGBLT	Simon W Hessel GB Ltd	5.13	5.90
BCSHINHE	Simon W Hessel Interitance	4.39	5.05
BCSHTRAV	Simon W Hessel Travel Game	4.39	5.05
BCSI3DBO	Software Invasion 3D Bomb Alley	5.87	6.75
BCSIATTA	Software Invasion Attack on Alphacenturi	5.87	6.75
BCSIEAGL	Software Invasion Eagles Wing (B)	5.87	6.75
BCSIGUNS	Software Invasion Gunsmoke	5.87	6.75
BCSISPOO	Software Invasion Spooks & Spiders (B)	5.87	6.75
BCSIVORT	Software Invasion Vortex	5.87	6.75
BCSMDIS	Simonsoft Disassembler	5.87	6.75
BCSS2002	Superior Software 2002	5.87	6.75
BCSSALID	Superior Software Alien Dropout	5.87	6.75
BCSSBATT	Superior Software Battle Tank	5.87	6.75
BCSSCENT	Superior Software Centipede	5.87	6.75
BCSSCOLD	Superior Software Colditz Adventure	5.53	6.35
BCSSCRAZ	Superior Software Crazy Painter	5.87	6.75
BCSSCRIB	Superior Software Cribbage	5.13	5.90
BCSSFAIR	Superior Software Fairground	5.87	6.75
BCSSFROG	Superior Software Frogger	5.87	6.75
BCSSFRUI	Superior Software Fruit Machine	5.87	6.75
BCSSGALA	Superior Software Galaxians	5.87	6.75
BCSSHUNC	Superior Software Hunchback	5.87	6.75
BCSSINVA	Superior Software Invaders	5.87	6.75
BCSSOVER	Superior Software Overdrive	5.87	6.75
BCSSPONT	Superior Software Pontoon	5.13	5.90
BCSSQBER	Superior Software QBert	5.87	6.75
BCSSROAD	Superior Software Road Runner	5.87	6.75
BCSSSPAF	Superior Software Space Fighter	5.87	6.75
BCSUBEEB	Sulis Software Beebeater	7.35	8.46
BCSUBESI	Sulis Software Besieged	7.35	8.46
BCSUGRAN	Sulis Software Grammar Tree Nouns	7.35	8.46
BCSUGRAS	Sulis Software Grammar Tree Sentences	7.35	8.46
BCSUGRAV	Sulis Software Grammar Tree Verbs	7.35	8.46
BCSUJUNW	Sulis Software Junior Wordsplits	7.35	8.46
BCSUJUST	Sulis Software Just a Mot	7.35	8.46
BCSUOPEN	Sulis Software Open Sesame	7.35	8.46
BCSUSTAW	Sulis Software Starter Wordsplits	7.35	8.46
BCSUTENF	Sulis Software Tense French	7.35	8.46
BCSUTIME	Sulis Software Time Traveller	7.35	8.46
BCSUWORD	Sulis Software Wordpower	7.35	8.46
BCVISNOO	Visions Snooker	6.61	7.60
BCVMDELT	Voltmace Delta Driver Cassette	4.39	5.05



Electronequip

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Acorn focuses on video discs

ACORN is to set up a special group to develop its interactive video disc technology and keep the company's lead over Japanese competition.

An interface will be launched before the end of the year to enable the BBC micro to control video discs running on the Pioneer system. And in the spring a special unit will be released combining the BBC's intelligence with the interface and software.

Acorn MD Chris Curry told *Acorn User*: 'The interactive video centre will be run from the HQ of Acorn International in Maidenhead. It will concentrate on further development. There will be a promotional force to sell equipment and generate links with industry for training. Another team will create course material.

'We have a good start in the field, but the Japanese are snapping at our heels.'

At present video discs can only have information read from them, although Acorn's recent deal with BSR in Hong Kong aims to develop read-write laser discs. The great advantage of video over floppy and hard Winchester discs is their storage capacity.



Curry: 'Japanese at our heels'

Curry sees a big market for the present technology with interactive video, programs and data mixed on one disc.

Acorn first demonstrated a BBC micro controlling video 18 months ago at the BBC's exhibition in January 1983. The system controlled film of birds in flight and then asked questions which were answered on the Beeb's keyboard.

The BBC is already considering doing material for schools to back up TV series. Peter Bratt, producer of the *Science Topics* series said: 'The BBC is very interested in the possibilities of interactive video and the Acorn interface will make our life easier.

'One of the *Science Topics* programmes is being considered at the moment as a high priority to base an interactive disc around. However it's not something we would rush at.

'If we did go ahead it would be an important step and we want to get it right – not just illustrated CAL. We would want to take full advantage of interactive video.'

Concern over CES move to Acornsoft HQ

ACORN is to re-organise its educational arm CES – but managing director Chris Curry has set out to reassure the educational establishment about the future of the group.

CES (Computer Education Service) was taken over from ICL by Acorn last October and now the group is to move from Maidenhead to come under Acornsoft's wing.

The five programming staff have been asked to move to Cambridge, some having the option of jobs in Acorn International and staying in Maidenhead. The information officer has, however, been made redundant as her role is to be taken over by staff already in Cambridge.

Closer

Chris Curry explained: 'Educational software will continue to be the responsibility of CES, but the group will come under the aegis of Acornsoft management.

'We are going to increase the scale of CES operations and put more people and money into CES. It must be closer to the body of the company to prevent duplication.'

Reputation

CES has gained a good reputation and established a close liaison with many schools, including providing people to help with courses.

Howard Curtis, chief examiner of 'O' level computer studies for the Joint Metriculation Board, told *Acorn User*: 'CES has my full support and I think it is a pity the changes have been made without consultation – and that they're losing a dedicated information officer.

'Schools and advisers are crying out for help and CES is one of the bodies they look to. CES gives Acorn a friendlier face than exists within the rest of the company.'

Colin Monson, adviser for more than 400 schools in Berkshire, also expressed concern: 'Our contact with Acorn is through CES, as we have found it difficult to go to Acorn, and the dealers know little more than we do.'

News for schools database service

by Geoff Nairn

NEWS International, owner of *The Times*, looks set to launch a 'dial-up' information service for schools.

A variety of educational news and information will be put on a large database which could then be accessed using a telephone and modem.

A trial service has been running using a closed database on Telecom Gold (British Telecom's electronic mail network), to send the information around the country.

If the scheme is given the go-ahead, a much-reduced subscription charge will have to be negotiated with BT to run on Gold, for the standard subscriber has to pay £100 to join and then a minimum of £10 per month – plus phone bills. The other option would be for News International to set up its own computers to run the database.

The trials has been running in several schools for six months – although no-one will say where. In fact News International has refused to discuss the project at all. A final decision has yet to be taken on the format and extent of the scheme, but it would obviously be of immense benefit to schools and information technology in general.

Micronet stars

STAR NET is a space war game now on Micronet – with up to 1000 players at a time. Each move costs 10p, but there is a prize for the first emperor of the 3000-star universe.

Professionals on-line to DB

SPECIALISED 'dial-up' database services already exist in this country, but they are expensive to use. Eurolex caters for the legal profession, and enables lawyers to study the latest cases and access a library of more than 44,000 reports. In total, 300 million words of legal information reside in the computer data files. It can be accessed using Telecom Gold, or indeed by dialling an ordinary phone number; but at £75 an hour few amateurs would want to use it.

The British Library runs Blaise, which enables provincial libraries to see what books are held at headquarters. The Polis database is a computerised version of Hansard, the House of Commons' journal.

British and American news services have been using computers for some time. Reuters has a very successful database service for financial news and its reporters send in copy from portable computers.



Super Champ enters UK ring

THE Super Champ, claimed to be the top-selling joystick in the US for the last two years, is now available in the UK.

Its distributor, Dean Electronics of Ascot, says it has several features so far not available to UK games players: 10 feet of retractable cable; a contoured handle to suit both left and right-hand players; and a swivel base with suction cups for single-handed control.

It is compatible with the Electron and BBC B through an interface and costs £12.95 through high street stores or direct (£1 for p&p) from Dean Electronics, Glendale Park, Fernbank Road, Ascot, Berks.

The end for 'A'

THE BBC model A micro will no longer be sold from September 1984. This is, says Acorn, because it accounts for only a small percentage of BBC microcomputer sales.

Orders for the model A will be honoured up to August 31.

Sales of both models A and B since the launch of the BBC micro in 1982 now exceed 300,000 units worldwide.

Budget monitor

OPUS has launched a high resolution monitor that it claims costs about £100 less than its rivals.

It is a 14in RGB monitor manufactured by JVC and costs £279.39, including VAT, cable, delivery, manual and a year's guarantee.

Resolution is 580 × 470 and display 80 x 25.

Opus also markets a medium resolution monitor (370 x 470) at £221.89. Both are available from Opus dealers.

Indian schools to take Beeb micros in bulk?

INDIA could soon become Acorn's biggest overseas market – the jewel in the computer company's export crown.

Information Technology Minister Kenneth Baker has already held out the prospect to Parliament, predicting that the BBC micro is set to become the standard educational micro in Indian schools.

But what the Minister failed to mention was that the super-salesman whose efforts helped pull off the coup was . . . Her Majesty the Queen.

For it was her gift of half-a-dozen Econet systems to the Indian President Zail Singh during the Royal tour last year that helped lay the foundations of this potentially huge export market.

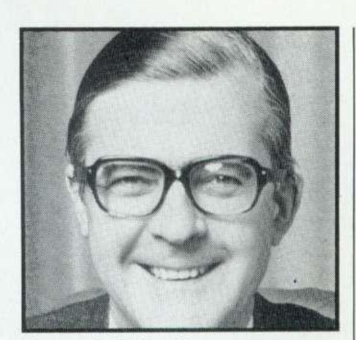
A joint working party has already been set up between the Department of Trade and Industry and the Indian government to examine the long-term provision of British micros.

The Beeb, though, is already doing very well in the Indian market – based on its success in providing the overwhelming majority of micros in the British government's schools scheme.

The growing overseas prospects are not confined to India however. More than 30 countries have sent educational teams to the United Kingdom to study how Britain has established its computer education programme.

The result, according to Mr Baker, is that Acorn and other companies involved in the schools scheme are now selling abroad 'in substantial quantities.'

The current Microcomputers in Schools scheme is due to end in December.



Kenneth Baker: boasts success

The Minister told MPs: 'The scheme has undoubtedly been a success and we can rightly boast that we are, in terms of education, the most advanced in the use of computers.'

Now Department of Trade and Industry officials are looking at whether further support schemes are necessary.

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♦t1◊This short section of text illustrates some of the
facilities available when typesetting with ♦it◊TypeWise♦ro◊
and the ♦it◊Anvil System♦ro◊.

♦bo◊Typefaces♦ro◊
The new Wordwise print control codes IT (italic) and BO (bold-
face) are used for ♦it◊italics♦ro◊ and ♦bo◊bold♦ro◊
respectively; ' and , followed by ^ or V produce
♦'^◊superscript♦'v◊ and ♦,v◊subscript♦,^◊ in the same way
as Wordwise does using its OC codes on a full-function printer.
The codes T(no.) and H(no.) are used to change text and heading
styles, which may be any or all of type-size, type-face, line-
advance, linelength, indents and justification.
```

Typewise example

Your text typeset

WORDWISE users can now have their text professionally typeset. The service, which lets you have direct control of such things as type font, type size and headings, is provided by Somerset company Wordsmiths.

With its *Typewise* system, the user has, in addition to the normal Wordwise embedded commands which set such things as margins and tab stops, extra 'typestyle' commands embedded in the text. These are ignored by Wordwise, but if a text file using these additional commands is sent to Wordsmiths, it will be typeset on their computerised Anvil system. The cost works out at about 75p per 'k' of text.

A program called *Read* is available at £25 to complement the service. This will display your files on the screen with all the control codes highlighted. This gives you some idea of how the text is going to appear in print.

Wordsmiths has run the Anvil service for Wordstar users for about two years, and several computing books for the Beeb and Electron have been produced using it, including *Beyond Basic*. But this is the first typesetting service for a cheap wordprocessing package on a Beeb.

Switch on to amateur TV

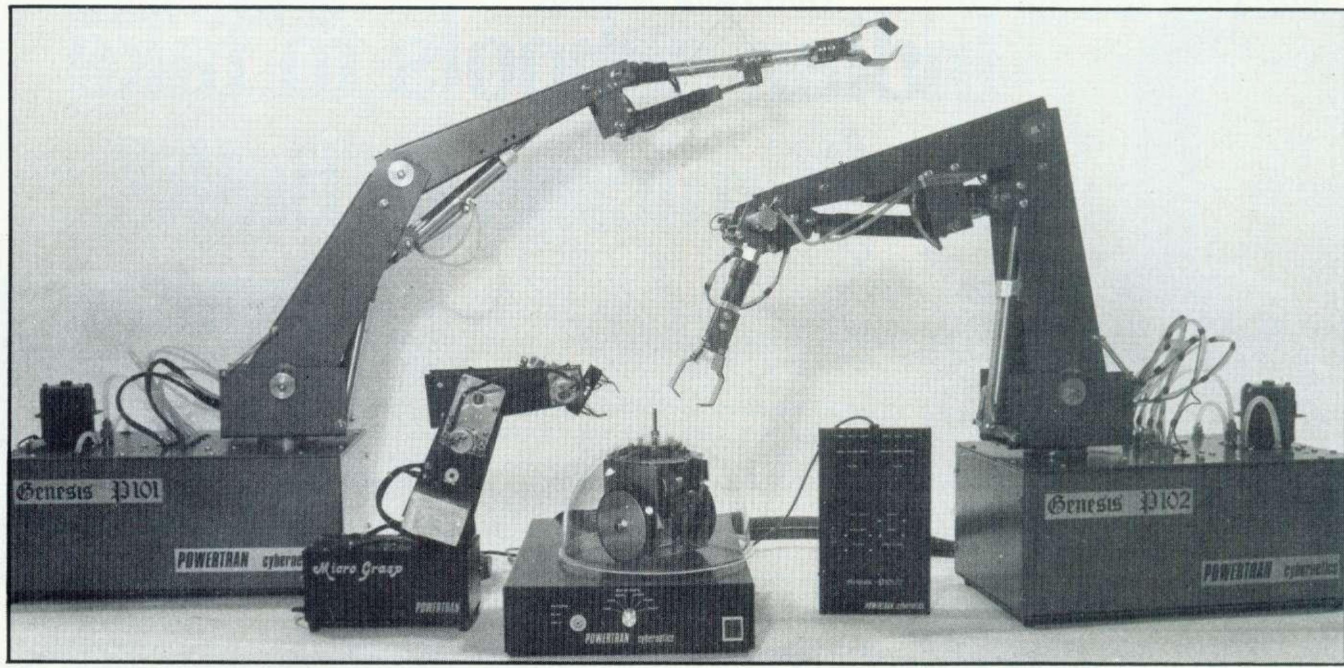
DESPITE the range of broadcast and cable TV services now available, it seems that some people are still not satisfied. Amateur TV, using the Slow Scan TV system, is becoming increasingly popular – especially among the amateur radio brigade.

One such 'ham', John Melvin, has developed an add-on for the Beeb which enables you to receive SSTV transmissions and display the pictures on the monitor screen.

The unit plugs into the Beeb's I/O port and comes complete with software and demonstration TV pictures.

Previously, the reception of SSTV required expensive equipment. At £93 – or £17.50 for just the construction details – John Melvin's solution is considerably cheaper.

For further information contact John Melvin at 2 Salters Court, Gosforth, Newcastle, or if you are a ham give him a call – his shortwave callsign is G3LIV.



Powertran robots, from left to right: Genesis P101 at £1700, Micro Grasp at £312, Hebot at £115, and Genesis P102 at £1200

CALling all educationalists

THE use of computers is one of the most debated subjects in education, with little sign of a consistent policy in schools. CAL 85 is a symposium which hopes to alleviate the confusion.

CAL, computer-aided learning, means learning with, rather than about, computers. The meeting will take place from April 10-13 next year and will include workshops, lectures, exhibitions and demonstrations.

The organisers are keen to attract delegates from all levels of education and emphasise the desire to see participation from primary and secondary schools.

Readers who would like to give papers or have ideas for workshops should contact Richard Phillips at the Shell Centre, University of Nottingham NG7 2RD.

Z80 'gift' in Torch package

GCC is set to follow up its Starbase database software with a set of CP/M financial packages to run on the Torch Z80 second processor.

First is the *Sage* integrated accounts program which comes with the Z80 thrown in at £431. Next is a spreadsheet called *Cracker*, designed to work with 80-track, double-sided disc drives.

GCC has exclusive rights to implement *Sage* on the BBC micro, with customers getting a free Z80 for the price normally charged for the software alone.

Cracker was described by Barry Billingham at GCC as very friendly and more powerful than Perfectcalc. It will take DBase II files and should come in at under £200.

At the end of July an update to Starbase on disc will enable it to work with Computer Concepts' Wordwise word processing chip.

Later in the year, a memory board will be released which will hold up to four 8k RAMs and 16 ROMs.

The Z80 second processor supplied with Sage comes in a wedge-shaped box which is smaller than a standard disc drive. Included with it is a sideways ROM and the Torch CP/N operating system on disc. It connects by a single cable to the BBC's Tube interface.

Four ways to make a robot connection

FOUR robots from Powertran Cybernetics can all be connected to the BBC micro, although you'll need to be able to assemble them and write the software yourself.

Top of the range is the Genesis P102, which has a built-in microprocessor, memory and control box. It costs about £1700. A simpler version, the P102, is £500 cheaper. Both come with RS232 connections, but they are capable of being used on their own.

Micro Grasp is an electrically powered arm costing £312, and Hebot is a turtle at about £115. These prices include a special interface board which is configured for a Sinclair, but can be adapted for the BBC. These two plug into the user port.

The turtle includes collision detectors, retractable pen, flashing eyes and a horn! It also features two-wheel drive.

The Powertran robot kits are designed mainly for computer studies courses and as extensions of control studies. Assembly instructions and tips on programming the devices are included in the price.

Details from Powertran Cybernetics, Portway Industrial Estate, Andover, Hants SP10 3AA.

Adventurous line in learning

STORY is an educational program for children which enables them to write their own illustrated stories. As the text develops, certain keywords trigger off pictures displayed on the screen.

There are 64 pre-programmed pictures in the software, up to seven of which can be used in each composition. Once the story has been completed, it can be saved and printed out.

Story costs £7.50 from H&H Software on cassette. Disc versions are also available. The program comes with a 16-page booklet.

Readers with Concept keypads can help children develop shape and letter skills with two programs from LTS of Studley, Warwicks at £9.95 each.

Reliable Original Microcomputer Software



Available from all good BBC Computer Dealers.
Available by Mail Order from Computer Concepts, 16 Wayside, Chipperfield, Herts WD4 9SJ.
Or by 'phoning with your credit card number on (09277) 69727.





Disc Doctor
The ultimate utility ROM for the BBC micro

CARETAKER
The BASIC utility ROM for the BBC micro

Graphics ROM
CIRCLES & PATTERNS
3D-PLOTTING
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FAST LOGO GRAPHICS

Print master
The printer utility ROM for the BBC micro

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Wordwise
The word processor for the BBC micro

TECHNOMATIC

BBC Computer & Econet Referral Centre

01-452 1500 01-450 9764 01-450 6597 Telex 922800

TORCH UNICORN

Designed with a total expansion capability

The Torch upgrade will give you a sophisticted business/professional system. However it doesn't stop there — it gives you the potential to expand — an expansion that no other current system can offer. Today, (not promises of 'one day'!), we are able to offer Hard Disc capability, networking of up to 254 machines, right up to the extra processing power of a 68000 32bit processor with 256K RAM, and optional UNIX operating system. **The potential is here!** The TORCHNET system, (software is included with all systems!), is a cost-effective method of linking office computing equipment in a simple and expandable fashion. TORCH means communication, whether it is inter-room communication, automatic 'home-to-office' communication, or electronic mail allowing a Torch user to initiate telex transfers, send telemessages, use Electronic Mail (e.g. Telecom Gold), and talk to large mainframes. — **The potential is here!** Hardware is of no use without a suitable range of software, and the Torch can choose from a massive range of business, financial, application and language software. (Did you know that the Torch system has five times more software available for it than the IBM PC!) Why not contact us for your requirements?



TORCH BBC ADD-ON PRODUCTS

TORCH Z80 DISC PACK

The proven upgrade for the BBC Micro. Comprising 2 × 400K disc drive, Z80 processor with 64K of memory, and a CP/M compatible operating system. The system is supplied complete with the PERFECT software range including PERFECT WRITER, PERFECT SPELLER, PERFECT CALC, and PERFECT FILE. Full TORCHNET software is also supplied allowing sophisticated networking between other units.

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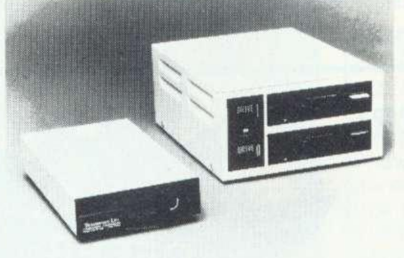
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We now stock the high performance yet economical 3M range. Due to advanced production techniques, a higher standard has now been reached, enabling Scotch to guarantee error free performance for life.

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The latest in miniature data-storage technology. Totally hardware & software compatable with $5\frac{1}{4}$" drives (can be used together!). Supplied complete with format disc, manual, cables etc. **£150**(b).

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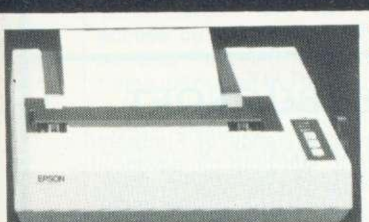
A full implementation of the IEEE-488 standard, providing computer control of compatible scientific & technical equipment, at a lower price than other systems. Typical applications are in experimental work in academic and industrial laboratories. The interface can support a network of up to 14 other compatible devices, and would typically link several items of test equipment allowing them to run with the optimum of efficiency. The IEEE Filing System ROM is supplied. **£282.**

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Converts your BBC into a fully fledged Teletext Terminal. In addition to normal reception of Teletext pages, it is able to 'download' software as well as saving standard pages on any of the four TV channels. **£196.**

Continued on page . . .

PRINTERS



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Epson DX100—a new daisy wheel has the hallmark of Epson's quality performance and reliability. The **JUKI** and **BROTHER** daisywheels provide a quality normally found in printers costing far more. Printer cables, interfaces, ribbons, paper etc. are all normally available from stock.



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Our current version of the highly popular Eprom programmer is now being enhanced to provide more and better facilities for easy programming by the user. The software will maintain its superiority over all currently available similar programmers. The range of eproms handled has been widened, to include the eproms with lower programming voltage and eproms which can be programmed using algorithm. Control of all operations has been moved to the keyboard. The screen display has been improved to give more information. The screen editing facilities have also been modified to simplify the data entry.

Preliminary Information

* **The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5v eproms, and all but the 27256 in a single pass.**
* The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
* **No knobs or switches to fiddle with — total control from the keyboard**
* Fully software driven with easy to understand instructions displayed on the screen.
* **Eprom type selectable from the keyboard**
* Selectable programming voltage 25/21/12.5V
* **Defaults to normal programming with high speed algorithmic programming selectable, for a device with suitable capability.**
* Continuous screen display of eprom type, option and address range selected.
* **Full screen editor with HEX or ASCII input. Constant display of logical eprom adress and the actual ram address.**
* Can read, blank check, program and verify at any address/addresses on the eprom.
* **Full Tape/Disc filing facility.**
* Several basic programs can be entered on a single eprom and called up with individual name.

EPROM ERASERS

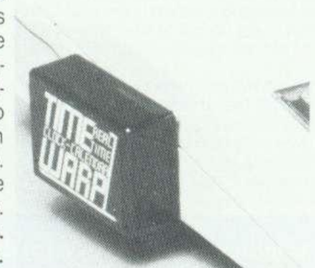


UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59 + £2p&p.**
UV1 as above but without the timer. **£47 + £2p&p.**

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SMARTMOUTH

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A ready built totally self contained speech synthesiser unit, attractively packaged with built-in speaker, AUX output socket etc. — no installation problems! It allows the creation of any English word, with both ease and simplicity, while, at the same time being very economical in memory usage. You can easily add speech to most existing programs Due to its remarkable infinite vocabulary, its uses spread throughout the whole spectrum of computer applications — these include industrial, commercial, educational, scientific, recreational etc. No specialist installation — no need to open your computer, simply plugs into the the user port — and due to the simple software, no ROMS are needed.



SMARTMOUTH is supplied with demo and development programs on cassette, and full software instructions. **£37 + £2.50 carriage.**

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* See our other advertisement on page 14

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Action in Olympia

Geoff Nairn reports on the big stories to emerge – so far – from the Acorn User Exhibition: amazing modems, spritely advances and software that exploits the 6502 second processor.

Plenty of peripherals and the programs to put them into action will be receiving their first public showing.

THIS year's Acorn User Exhibition, to be held at Olympia on August 16-19, looks set to easily top last year's show, with 35,000 people expected to pass through the doors.

About 140 exhibitors have booked stands, so there should be something for everyone. As you might expect, Acorn Computers will be there in force, as will your's truly *Acorn User* with a problem clinic for readers.

The education sector will be well represented with many familiar names – and quite a few new ones. ASK, Golem, Edsoft and Softcentre will represent the educational 'cottage industry', with MUSE and MEP as the Government-backed 'heavyweights'.

In among the usual plethora of peripheral suppliers are to be found several new products. Microware will be showing a new range of Epson 5¼in disc drives; and Silicon Disk, the RAM alternative to disc drives, will be available at a discount from Solidisk.

Two new modems will be putting in an appearance at the show. The first, the Nightingale, runs at 300, 1200 or 1200/75baud and so can access bulletin boards, Prestel and Telecom Gold. It is being marketed by Pace.

Even more interesting is the Loco Systems SCM 100 modem. SCM stands for Software Controlled Modem – in other words, a ROM chip that plugs into your Beeb to control the modem directly. The beauty of this is that there are no controls on the modem itself – the software automatically selects such things as baud rate and protocols depending on the service you've dialled. As they say, 'Approval is being sought' for both these modems.

With the arrival of Acorn's 6502 second processor for the Beeb, the race was on to see who would be first to produce software which properly exploited it.

Well, Cardiff Micro Software has come up with a disc-based database program called Datafile which uses the second processor to store up to 3000 records on a double-sided, 80-track disc. Unusually, there is also a version which runs on Econet.

Simonsoft is using the Exhibition to launch its new series of Beeb games. They concern Oz the caveman. Simonsoft also will be demonstrating Sprites Version 2 – an animation package which can produce an 18-fold increase in speed over normal Basic.

The Educational Software Company has some new programs for the Robin Lightpen, which talks as well as draws.

The show runs from August 17-19, 10am to 6pm (5pm on last day). On Thursday 16th, times are 10am to 7pm, with the morning reserved for the trade. Tickets cost £2, or £1 for under 16s.

Arm-in-arm with a robot



R2D2 – that lovable whistling dustbin from the film Star Wars – is rumoured to have his heart set on going to the Acorn User show.

Tony Dyson, the robot's maker, runs a company called Droid Factory which, from making promotional robots, has now gone down-market with a £400 robot arm for the Beeb. (Unfortunately R2D2 will not be for sale.)

As well as R2D2, Tony was also responsible for the robot seen showing John Cleese a thing or two in the recent Sony adverts on television.

The robot arm is based on an industrial version and is claimed to consume very little power as it uses servo motors rather than stepper motors. It also has inter-changeable fingers which, although embarrassing to humans, is a plus point for robots.

R2D2, when asked to comment on Tony's latest protege, could only whistle '!!*??!'.

Ultra the android is the Droid Factory's latest offering at Unit 14, 70 Wooton Rd, Abingdon, Oxfordshire.

AMS lets mouse loose

ADVANCED Memory Systems is set to let loose a pet mouse at the Acorn User Show. But before the Olympia officials call in a pest control officer, we should say that this mouse is of the non-furry variety.

AMS, who were first with the 3in disc drive, have now pulled off a similar coup with the first 'mouse' for a home computer. A mouse is a small hand-held box which, as you move it around the desk top, moves a pointer on the screen. Up to now only business machines such as Apple's Lisa have used mice; now the Beeb gets its own mechanical rodent.

AMS claims any program can be converted for use with the £70 mouse, in much the same way as a joystick. Four main uses are envisaged: word-processing; on-screen editing of programs; games; and graphics.

For details of bulk discount tickets and the Exhibition, contact:
Computer Marketplace Exhibitions, 20 Orange St, London WC2H 7ED.

Micropower packs 'em onto disc

MICROPOWER is to make disc versions of its best-selling games available for the first time at the Acorn User Exhibition.

The top 11 will be on 5¼in discs at £9.95 each that run on 40 or 80-track drives. For those who have the games on cassette, there will be an exchange service. The company will swap a cassette for a disc for £4.95.

The games are: *Killer Gorilla, Rouble Trouble, Stock Car, Frenzy, Block Buster, Gouls, Jet-Power Jack, Felix in the Factory, The Mine, Cybertron Mission* – and one other to be launched at the show.

These discs and the rest of the range will be available only on mail order after the show (postage 55p extra).

Beeb in GLC competition

A BBC micro game has taken joint first place in a Greater London Council competition. The idea was to design a video game which would successfully get across the GLC's anti-racist message.

Competitors had a free hand over the type of game – but it had to include an anti-racist quiz consisting of 12 questions – for example, 'How many black people live in London' – before the game itself could be completed.

Ian Lambert's entry for the Beeb featured that familiar sight around London, the red double decker bus.

Ian is pictured receiving his cheque from GLC Leader Ken Livingstone.

Also in the picture are his son Ivan, Paul Boateng, vice-chairman of the Ethnic Minorities Committee, and John Carr, chairman of the Staff committee.



Scientific suites

TWO companies have set out to provide software for scientists and engineers on the BBC micro.

Crecy Computer Systems is aiming a suite of programs at energy engineers and managers. The initial package has five parts, concerned with fuel, boilers, steam and steam turbines. A second unit on heat recovery is under way.

The pack is designed for people who have no experience of using computers and will run on a model B. It costs £45 on disc, including manual, from Crecy at 148 Liverpool Road, Penwortham, Preston.

Finersoft has released *Bstat*, which, as the name suggests, deals with statistical analysis.

Bstat costs £15 from Finersoft at 30 Edna Street, London SW11 3DP.

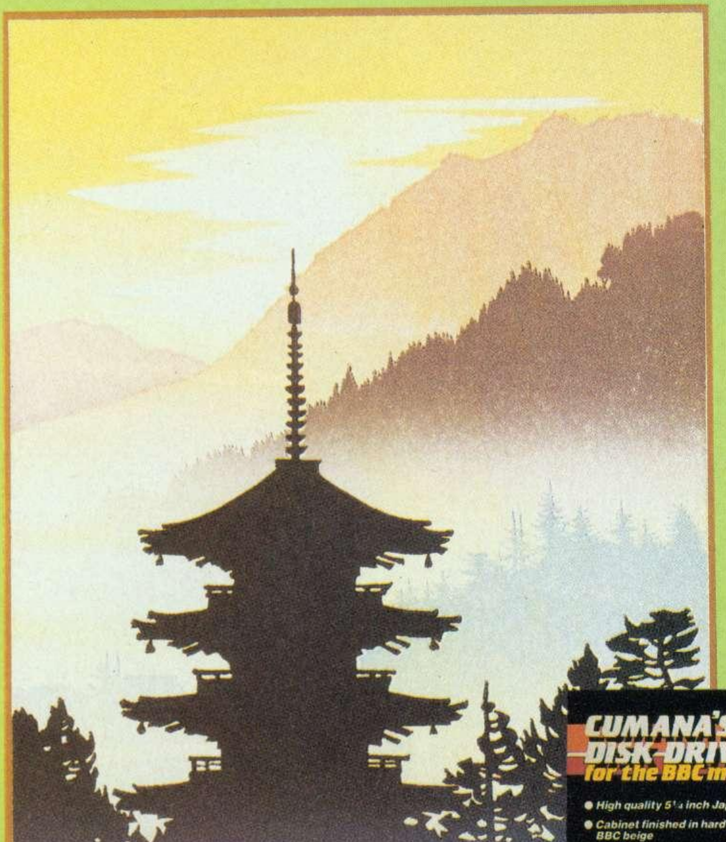
It's official – a Prestel adaptor

A VIEWDATA interface that links the BBC micro to Prestel and the electronic mail services has been launched by Acorn.

The Prestel Adaptor connects the Beeb directly to the telephone network, turning it into a powerful two-way computer terminal. The system can then automatically dial-up and access remote computers, including the Prestel and Telecom Gold facilities (if you've got the software).

It plugs into the RS423 port on the micro and the modern Type 600 BT telephone socket. The unit operates in full duplex mode, baud rate 1200/75.

The adaptor costs £113.85 (inc. VAT), and comes complete with a viewdata telecomms ROM and user guide. It is available only by mail order from Vector Marketing, London Road, Denington Estate, Wellingborough, North Hants NN8 2RL.



Print from Japan

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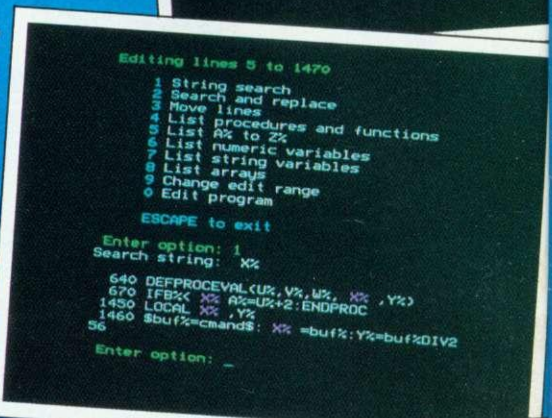
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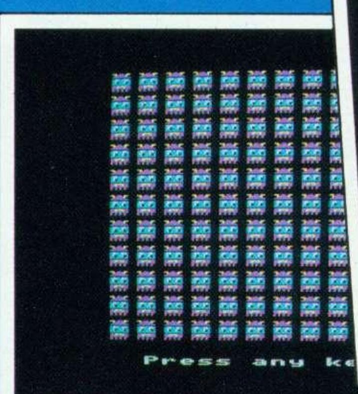
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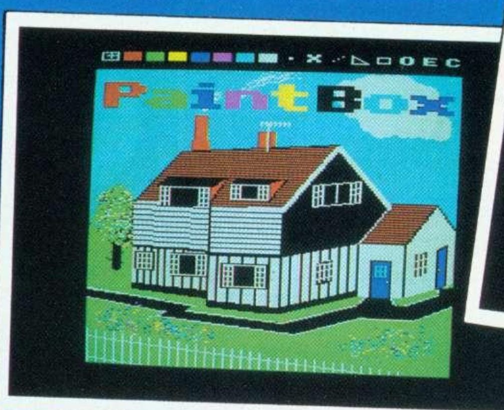


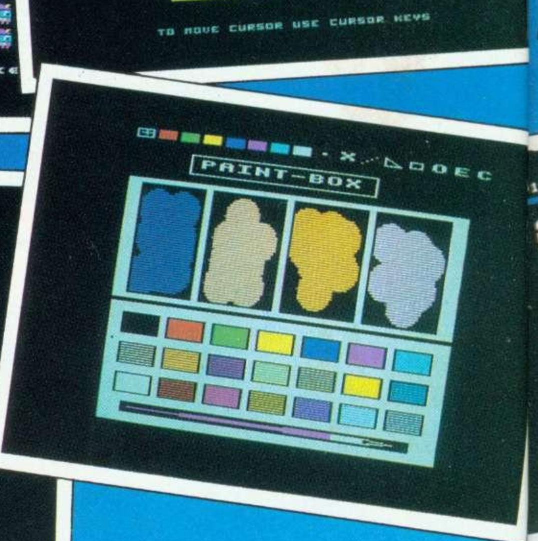


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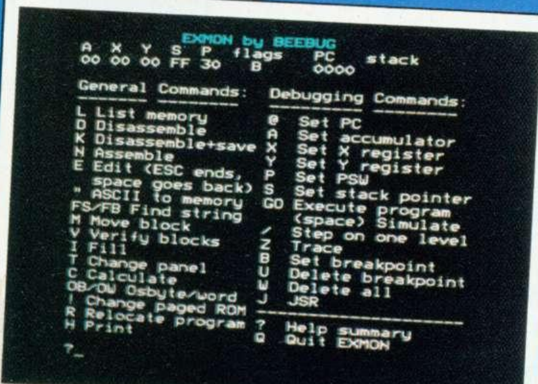
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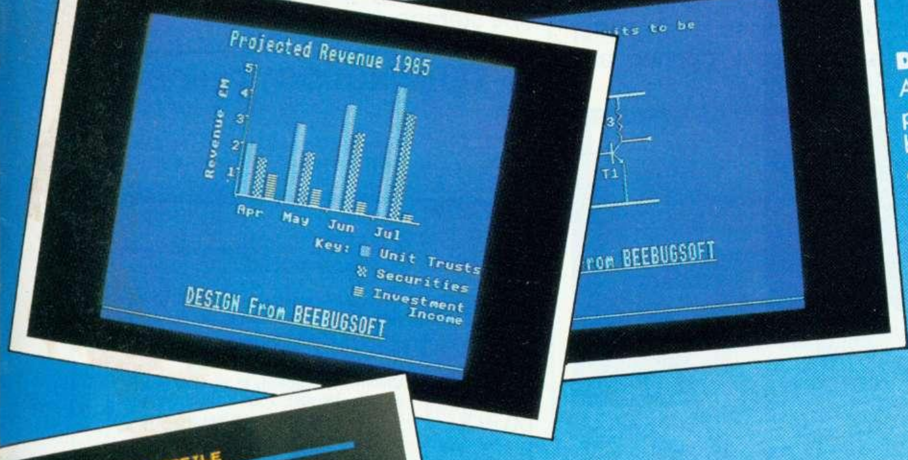




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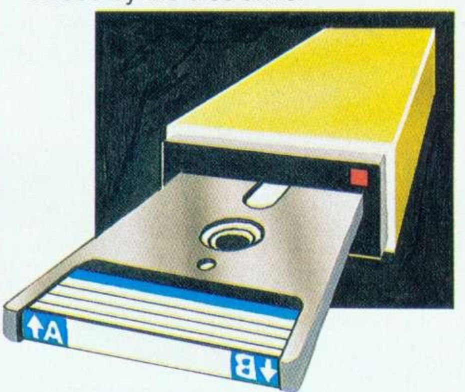
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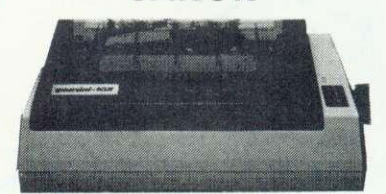
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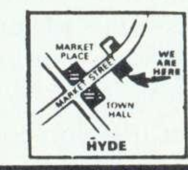
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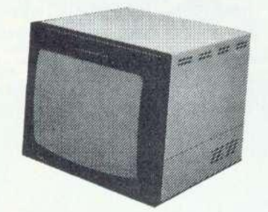
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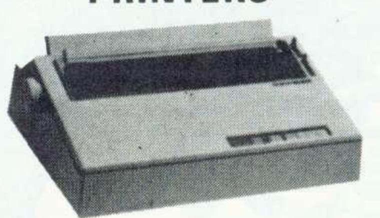
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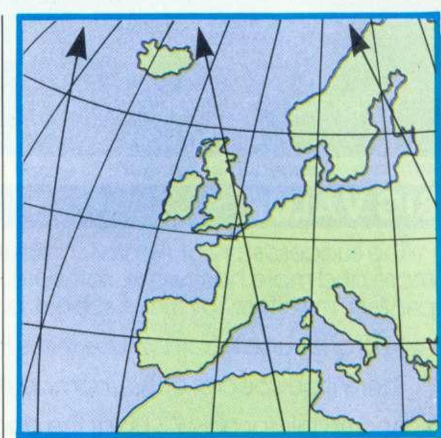
The outlook is bright for Beeb users to receive satellite pictures, says Robin Mudge

SWITCH on the TV in the early evening and you are bound to see one of those magnificent satellite pictures the weather men are so fond of. They are taken by satellites continuously orbiting the earth to help meteorologists study the world's climate, and predict our weather. The equipment they use is exorbitant, but now, using the BBC micro and a few peripherals, you can receive and display pictures broadcast by the American NOAA and Russian Meteor satellites.

Their orbits almost pass over the North and South poles and they take about 102 minutes for each revolution, during which time the earth turns about 25.5 degrees so each time the satellite goes round it looks at a different part of the globe. In this way a complete picture of the earth is built up in strips, each one slightly overlapping the last (figures 1 and 2).

The satellite takes two pictures side by side, one with visible light and the other with infra-red, as shown on page 29. The satellite spins rapidly and special equipment on board scans the earth's surface and sends a TV picture at 120 lines a minute, ie one line in half a second. This is a slow scan picture, when you consider that a domestic TV scans 625 lines in 1/25th of a second. Each scanned line is split into two, one part representing the infra-red and the other the visible light pictures and an FM radio signal is transmitted from the satellite on 137.5 MHz or 137.62 MHz.

Receiving the satellite signal is reasonably straightforward using professional receivers, or amateur versions costing far less: a suitable kit can cost as little as £50. Basically the receiver is little more than a modified domestic FM radio. A suitable crossed dipole aerial can also be bought, or made from an old BBC1 TV aerial.


Figure 1. Consecutive orbits

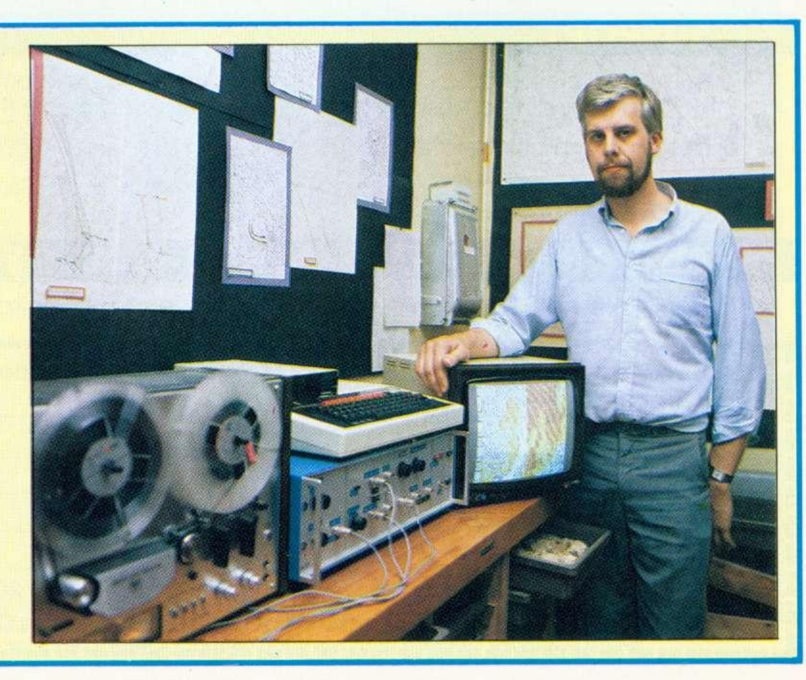
The picture information is carried by a 2.4kHz audible tone which changes with the brightness of the image: louder for the bright parts. This tone is used to

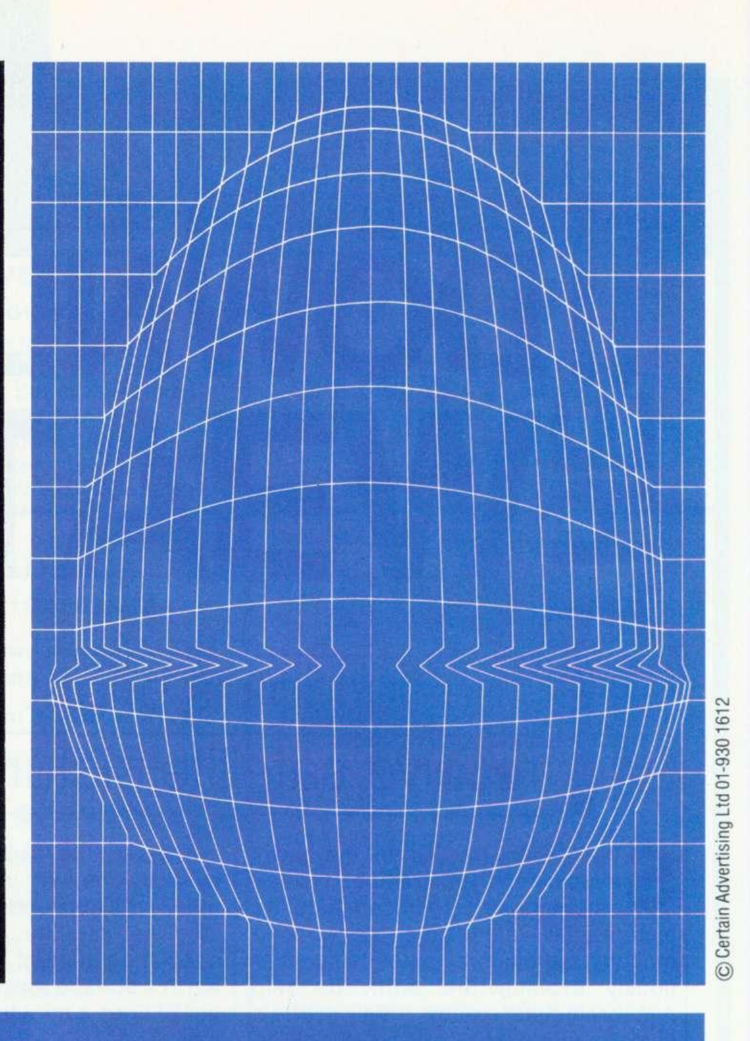
MICHAEL Furminger uses the BBC micro at Nene College in Northampton to download weather satellite information for his courses. It all started as part of a combined studies degree which covered metrology.

Michael explained: 'I picked the idea up and then along came the BBC micro with its interfaces and graphics. We then built a fast A/D converter, wrote the software and away we went.'

The weather pictures are used to give a day-to-day illustration of current weather patterns, and hence simple short-term forecasting. Over a longer period, the pictures saved build into an information base for further analysis. One of the major advantages is that the infra-red scale gives a very clear indication of weather patterns, as the hot and cold fronts show up very well.

And the idea has caught on: 'It has been taken up by many colleges and universities who have all built working models. I even had a call from Jodrell Bank!'



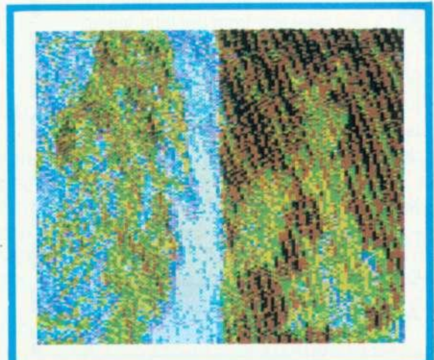


drive a facsimile (facs) recorder. In these machines a piece of light or heat sensitive paper is wrapped around a rotating drum and an image is exposed or burnt onto it by a scanning light or heating diode.

The transmission of facsimile pictures itself isn't new because the BBC used to transmit them in 1934 but the facs kits were expensive even then. Today a facs recorder can cost many thousands of pounds and this is where the BBC micro comes in, as with suitable software it can display a very good picture.

Michael Furminger from Nene College in Northampton has designed an excellent system which uses the BBC micro to display satellite pictures instead of an expensive facs recorder. He supplies the circuit diagrams and software for the project for only £5. His project breaks down into three parts: an accurate clock; a fast analogue to digital converter; and suitable software for the BBC micro.

The first two are construction projects. The clock is needed to synchronise the start of each picture line. Looking at the diagram of the received satellite waveform you will see two large pulses, one at the beginning and the other separating the two pictures (figure 3). These are synchronising pulses. The software has to accurately line all of these pulses one under each other to produce a square picture. If this is not done properly the picture can skew to left or right causing distortion. The clock is crystal controlled and produces accurate 2Hz pulses which the software uses to synchronise the lines. It is much easier to record the satellite signals on a stereo cassette or reel to reel tape recorder with the clock pulses on another track so they can be passed through the BBC micro at a much more leisurely rate after the satellite has passed.



The satellite takes two pictures side by side

Before the computer can display a picture the 2.4kHz analogue signal has to be turned into a digital one. Each line takes just half a second, which is too fast for the BBC's internal A to D converter (ADC). An external ADC with a very fast conversion time is needed and the signal is passed on to the Beeb's user port along with the 2Hz pulses from the other tape track.

The software produces a picture in either mode 1 or 2. In mode 1 a picture with resolution 320 by 256 pixels and four colours is produced, and in mode 2, 160 by 256 and eight colours. The software presents you with a menu allowing you to select a screen mode that displays a good black and white image, or a colour range designed to show different temperature bands on the infra-red picture. A picture is slowly built up on the screen as data is converted from the tape recorder. The image-producing routines run in machine code as Basic is not fast enough to process the data from the high speed ADC. Of course the software does a lot more than this as it corrects the geometric distortion found in the raw unprocessed pictures, which look like tall thin strips with all the land features highly squashed. Other programs in the package allow you to store

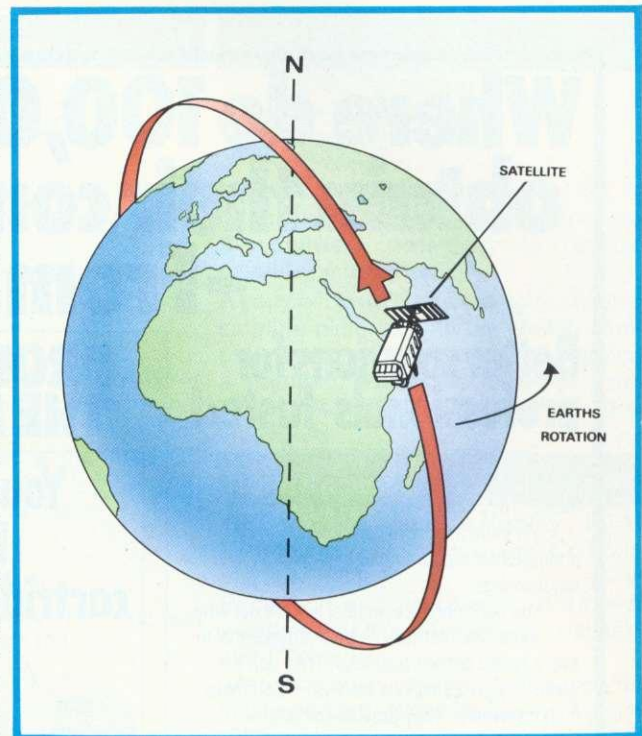


Figure 2. During the 102-minute orbit the earth turns about 25.5 degrees

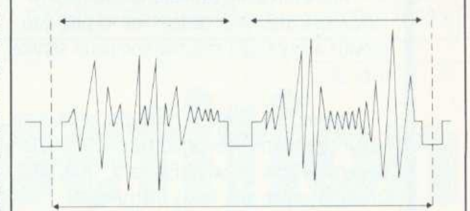


Figure 3. Received satellite waveform, showing synchronising pulses



Picture transmitted by the American polar-orbiting weather satellite Tiros-N

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pictures and view them at will and there is also a prediction program that helps tell you when the satellite is going to be overhead within receiving range – usually just two or three different times each day. Proper prediction tables can be purchased from the NASA Information Bureau.

The only disadvantage of Michael's package is the fact that the constructional details for the clock and high speed analogue to digital converter are limited to a schematic circuit diagram. You will have to make a hard-wired version or design an appropriate circuit board, but what can you expect for £5?

David Duff also has written software to turn the BBC micro into a weather picture display using the Unilab computer interface which has a built-in, high speed A to D converter.

Whichever system you choose to use you must get a letter of permission to receive weather satellite pictures from the Radio Regulatory Department of the Home Office. If you don't fancy the construction work and haven't got any friends who know which end of a soldering iron is hot, then you can buy a complete system for receiving weather satellites for about £2,100.

Hardware contacts

Receivers

Ambit International,
Parks Lane,
Broxbourne,
Essex.

Supply a kit to make a satellite receiver at about £50.

Microwave Modules,
Brookfield Drive,
Aintree,
Liverpool L9 7AN.

Supply a ready-built satellite receiver for £345 and also make a converter that changes the 137MHz to 30MHz which could be received by a modified CB radio.

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Aerials

Jaybeams,
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Software contacts

Michael Furminger,
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Michael supplies a complete set of instructions to build the hardware, and the software necessary to receive satellite pictures for £5.

A copy of David Duff's listing to receive satellite pictures with the Unilab computer interface is available for 50p and a stamped, addressed envelope from *Acorn User*, 68 Long Acre, London WC2E 9JH.

References

'BBC weather satellite display', by M Furminger, *Electronics and Computing*, July 1983

Reception and processing of Tiros-N weather satellite telemetry by J Gilbert and T Terrell

'Meteosat high resolution images', by M Christieson, *Wireless World*, August 1982

NOAA Handbook, available from the US Dept of Commerce, National Earth Satellite Service, Washington DC 20233

KEYBOARD BASICS

The keyboard can be a great obstacle to learning about your micro. Tessie Revivis' program will set your fingers tapping

APART from the actual process of learning to program, the keyboard can be one of the biggest obstacles to using your computer. If you've ever used a normal typewriter, you should have few problems, because there are few differences. On the other hand, if you have never used one then you must endeavour to learn your way around the keys. This takes time, and can be frustrating as no doubt you'll be in a hurry to get a program running. However, speed, two, three and even four fingers will come, eventually!

The keyboard on your Electron or BBC is often referred to as a 'QWERTY' keyboard. This isn't a fancy abbreviation, but simply denotes the fact that these are the first six letter keys (see photograph).

The major difference on the Elk's keyboard to a typewriter is that it doesn't have a return lever to take the typing carriage back to its start position on reaching the end of a line. Being more like an electric typewriter, the computer has a special key to do this, called the RETURN key. This is at the far right of the keyboard. Try pressing this a few times and you should see it perform a carriage return which scrolls (moves) the screen and any text on it up by one line, with any text at the top of the screen moving off of it and a new blank line replacing it at the bottom. Try it!

Now type some of the letter keys, try QWERTY for example. This will appear on the screen as the letters Q,W,E,R,T and Y. These are all capitals, or 'upper case'. However, just like a normal typewriter, it is possible to type each letter as a lower-case character. To do this you need to tell the Elk by pressing two keys at the same time. The keys are those marked SHIFT and CAPS LK and you'll find these on the extreme left. If you do this correctly the small yellow light next to the CAPS LK key will be extinguished. Try typing QWERTY again, this time it will appear as q,w,e,r,t and y! To get back to upper-case, press the same two keys together again, now the small yellow light will come on again. In most instances, a computer program must be written in upper-case characters as this is how the Elk recognizes program commands. If you only wish to type in a single lower-case character without leaving the upper-case mode, you can do this simply by holding the SHIFT key down and pressing the key you require in lower case.

The number keys all have a black symbol above them. For example, above the 1 key there is an exclamation mark (!). These are the characters that can be printed using the SHIFT-CAPS LK sequence first of all. Try printing a few, then come back to the normal unshifted mode. If at anytime you can't get back to normal capitals, then remember you can always reset the Elk by pressing the BREAK key.

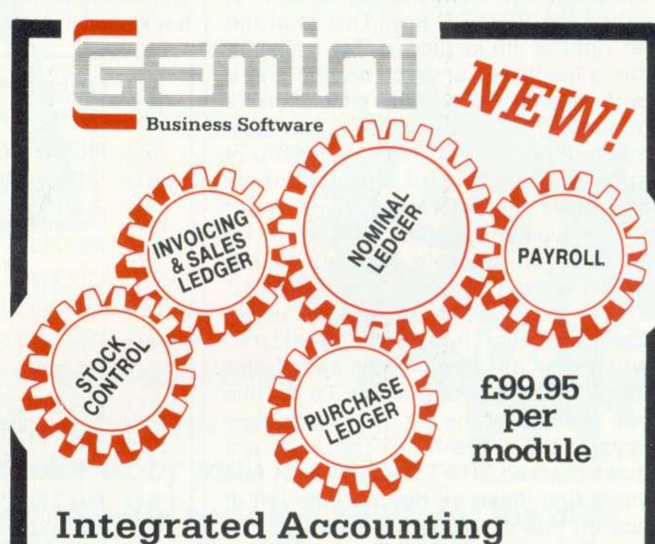
On the front of most keys you will probably have noticed the red coloured printing. On the letter keys these are in the form of words which relate to Basic commands, the instructions used by the Elk. Not every single command is available on the keys, there are too many and not enough keys, so only the more frequently-used ones are found

```
 10 REM *** RANDOM PROGRAM GENERATOR ***
 20 REM ***  FOR ELK AND BBC MICROS   ***
 30 MODE 6
 40 VDU19,0,4;0;0;
 50 PRINTSPC(6);"RANDOM PROGRAM GENERATOR"
 60 PRINT'SPC(4);"(c) Acorn User August 1984"
 70 PRINT''"Save this program on tape first"''
 80 PRINT"Now type NEW <RETURN>"
 90 PRINTSPC(8);"and then AUTO<RETURN>"''
100 PRINT"Now hit function key f0 and then"
110 PRINT"hit the other function keys, f1 to f9"
120 PRINT"as often as you like!"'
130 PRINT"When you get fed up press ESCAPE"
140 PRINT"and then RUN the program"
150 PRINT"to see your master creation!"
160 *KEY0 MODE 5|M
170 *KEY1 SOUND 1,-15,RND(200),RND(20)|M
180 *KEY2 MOVE RND(1000),RND(1000)|M
190 *KEY3 PLOT 85,RND(1000),RND(1000)|M
200 *KEY4 GCOL1,2|M
210 *KEY5 DRAW RND(1000),RND(1000)|M
220 *KEY6 GCOL2,3|M
230 *KEY7 COLOUR RND(4):PRINT"HELLO"|M
240 *KEY8 GCOL2,2|M
250 *KEY9 SOUND1,-15,RND(100),10|M
```

Listing 1. Just type in and RUN this program to create other programs!



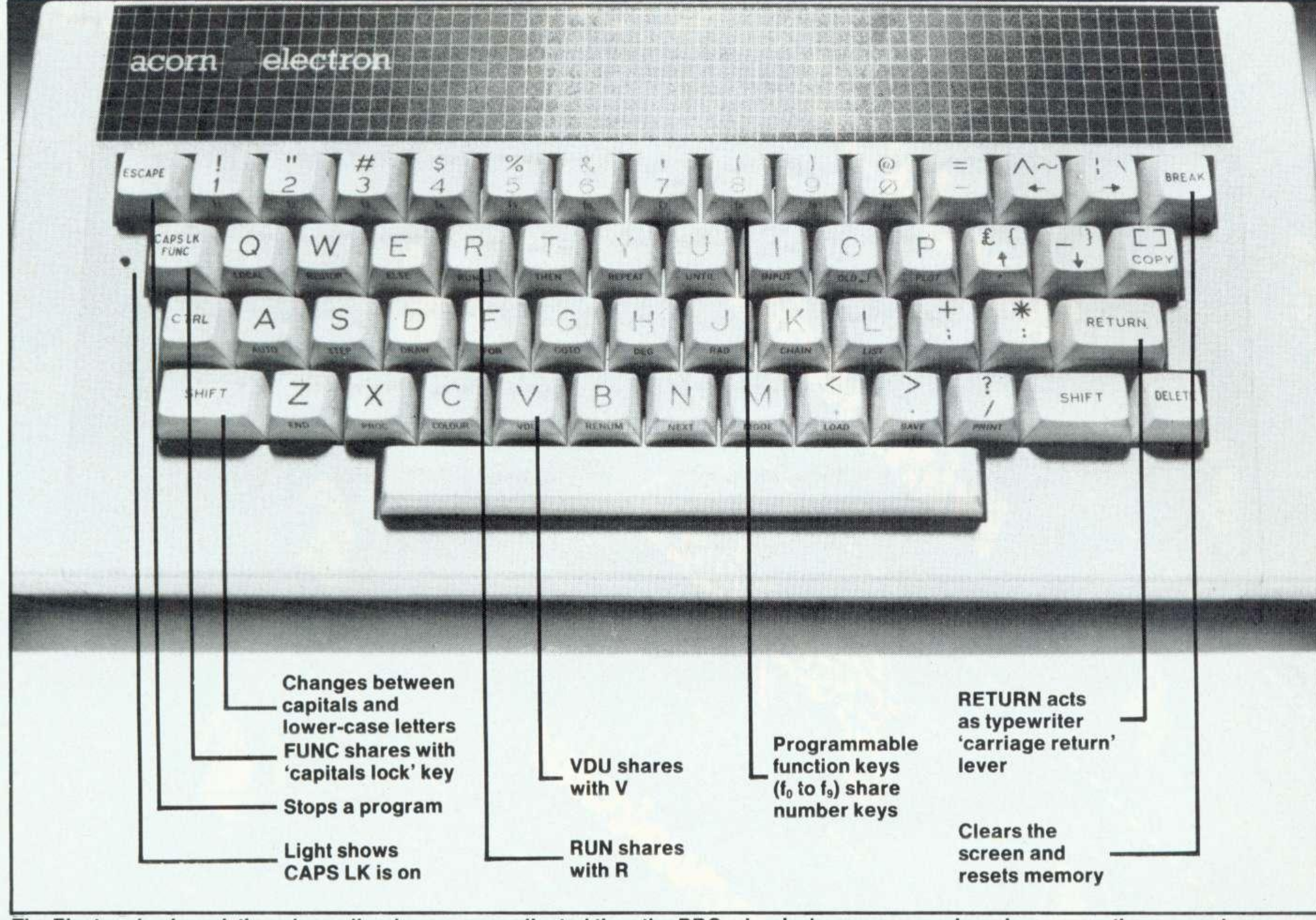
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Gemini



The Electron keyboard, though smaller, is more complicated than the BBC micro's, because many keys have more than one role

here. By holding down the key marked FUNC (it 'shares' the CAPS LK key) and pressing the key with the command you want, the entire command will be printed onto the screen, giving you single-key, command entry. You can type in a command word normally, it just takes longer. To illustrate the point we can write a very short program to make the Electron beep!

First, press the BREAK key to 'clear' the computer of any rubbish on the screen. Now type in the numbers 1 and 0, in other words the number 10. This is called the line number and is used by the computer to keep the program lines in order, so that line number 10 will come before line 20 which in turn will come before 30 and so forth. The fact that I've just gone in steps of ten has no relevance except that computer programs normally do: it means you can have extra lines without renumbering. Now hold the FUNC key down and press the V key. The letters VDU should have appeared on the screen. Release the FUNC key and now press key number 7; finally, perform a carriage return by pressing the RETURN key. The final result should look like this:

```
10VDU7
```

To run the program hold FUNC down and press the RUN key which shares the R key. The result should be a short beep.

If you look at the number keys you will see that the secondary FUNCtion of these is given as *f1, f2* etc. These are the function keys which are somewhat unique to the Electron and BBC micros. They are in effect programmable keys, which means you can insert a command or a series of commands into them. Pressing FUNC and the particular key will cause the items programmed into that key to be printed. For example, the command CLS is used frequently within programs but does not appear as a pre-programmed key. We could program the *f1* key to produce PRINT by entering the following line (remembering to press RETURN after):

```
*KEY1 CLS
```

This has entered the command CLS into function key 1. To prove this, hold the FUNC key down and press the 1 key; the letters CLS should appear on the screen. Other function keys can be programmed in a similar manner using the *KEY command which should be followed by the key number.

To end this month's section of First Byte, we present a program that will write other programs! Enter listing 1, which programs the function keys to perform certain tasks. Once you have entered it type RUN (remember to hit the RETURN key at the end) to define the function keys. If you wish, save the program to tape at this point. You will see from the listing that the definitions contain a '¦' symbol followed by a capital letter M. This sequence is used to tell the Electron to perform a return after printing the key definition. To obtain the '¦' sign you'll need to type SHIFT and the '¦' key which can be found to the left of the BREAK key.

Now type AUTO (and then RETURN); this command provides an AUTOmatic line numbering service, first throwing up line 10 and then line numbers in increments of 10 every time the RETURN key is pressed. As each line number is presented press a function key (ie FUNC and the particular numeric key) to enter a line of text. Press the function keys randomly and when you get fed up, hit the key marked ESCAPE. To run your random creation, press FUNC and R together and admire the results. When you want another program hit the ESCAPE key and repeat the sequence. There's no need to re-enter the key definition program as it will stay in the micro's memory.

HOW TO CORRECT PROGRAM LISTINGS

Martin Phillips offers his advice

LISTINGS typed in from magazines often won't work: sometimes the program is wrong, but often typing mistakes are the cause and it can be difficult to know where to start looking for faults. It is a tedious task to find all the mistakes, and, as Schmendrick's law explains, no matter how carefully you check a listing and no matter how many mistakes you find, there is always one more!

Correcting listings is a matter of practice and experience that is slowly and painfully acquired, so this month I present a program that is guaranteed *not* to run (how many other magazines offer such service?). The idea is to spot as many faults in the listing as possible. To make the task a little easier, a corrected copy is included. However, those brave or skilled enough can try to find all the mistakes (there are 50) without looking at the corrected version. Some will only be found when the program is typed in and run, and there is quite a collection of different error messages that will appear. If all else fails, a third version has every mistake indicated.

After all that effort, the program has to do something. This particular one can be used to find out about those mysterious hexadecimal (hex) numbers and how they relate to our normal counting system which uses base 10. It shows graphically and numerically the relationship between base 10 numbers (denary) and base 16 (hex) numbers. It will work equally well on the Electron or on the BBC. The program steps through the first 255 hexadecimal numbers showing how they are converted to base 10. Pressing the escape key at any time allows a denary number to be entered and the conversion is displayed on the screen. The hexadecimal numbers are shown in black, and the denary numbers in red. Table 1 gives a description of the program and what the various parts do.

40 PROCinitialise. This procedure initialises the screen colours, some of the variables and an array.
50 PROCclocks. Draws the two hexadecimal clocks on the screen.
60 This line takes the user into the second part of the program if the escape key is pressed.
70 PROCrun is the first part of the program where each number is converted from hexadecimal into denary in turn.
80-100 The run loop for the second part of the program. This is an infinite loop, and will repeat until escape or break is pressed.
140 Switch off key auto-repeat.
150 Set print field width to 0. This ensures that when numbers are printed out no gap will be left between them.
160 Dimension B and oldB will be used to store the values of the hexadecimal numbers. The array hex**$** contains the hexadecimal symbol for the appropriate hex number.
170 Switch off the cursor.
180 Change the background colour to blue.
190 Change colour yellow to be black.
200 Define graphics window.
210-230 Routine to store the basic hexadecimal symbols 0-9 and A-F in the array hex**$**.
240 Clear screen, defined by the graphics window, and colour it red.
260 Define a text window in the bottom part of the screen.
300 Join text and graphics cursors.
310-330 Print title at top of screen in colour 2.
340-500 First print two sets of hexadecimal numbers in two circles, and then draw the circles. To simplify the program, the graphics origin is moved to the centre of each circle as it is drawn.
550-570 Cycle through the first 255 hexadecimal numbers. PROCdisplay will show the numbers numerically and graphically.
600-710 This procedure takes a number, converts it to two hexadecimal digits, B(0) and B(1). Then it undraws the clock hands and redraws them in the new positions. PROCprint handles the numeric printing in the bottom half of the screen. The program then halts until a key is pressed before ending the procedure.
730-960 This is a long, drawn out routine to print the numeric information on the screen. It could have been shortened had it not been necessary to use several colours for clarity of display.
980-1040 This procedure draws (or undraws) the clock hands for either clock. If Z = 5 the procedure will draw a line, if Z = 7 it will undraw the line.
1060-1120 This routine forms part of the second half of the program, and repeats until a number in the range 0 to 255 is input. It then calls up the display routine before returning to the main part of the program.

Table 1. Demonstrates the relationship between denary and hex numbers

```
  20 REM Uncorrected version
  30 MODE 1
  40 PROCinitialise
  50 PROCclock
  60 ON ERROR GOTO 80
  70 PROCrun
  80 REPEAT
  90 PROCINPUT
 100 UNTIL0
 110 END
 120 :
 130 DEFPOCinitialise
```

```
  20 REM Correct version
  30 MODE 1
  40 PROCinitialise
  50 PROCclocks
  60 ON ERROR GOTO 80
  70 PROCrun
  80 REPEAT
  90 PROCinput
 100 UNTIL0
 110 END
 120 :
 130 DEFPROCinitialise
```

```
  20 REM Uncorrected version
  30 MODE 1
  40 PROCinitialise
  50 PROCclock
                 ↑
  60 ON ERROR GOTO 80
  70 PROCrun
  80 REPEAT
  90 PROCINPUT
          ↑↑↑↑↑
 100 UNTIL0
 110 END
 120 :
 130 DEFPOCinitialise
        ↑↑
```

Samples of Martin Phillips' three programs. They can be found in full on pages iii to vi


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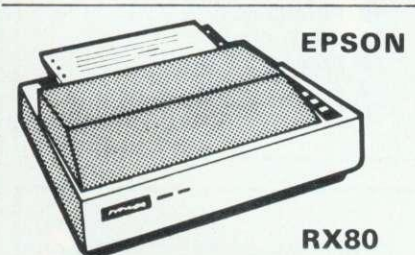
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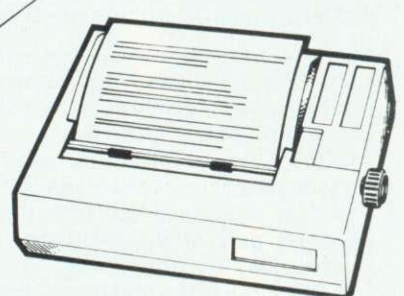
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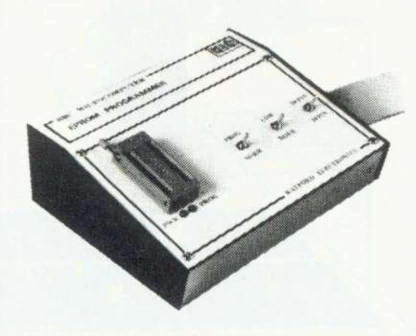


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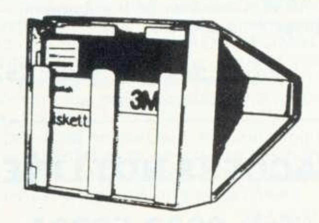
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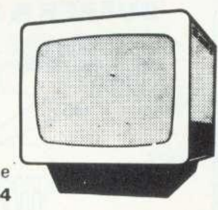
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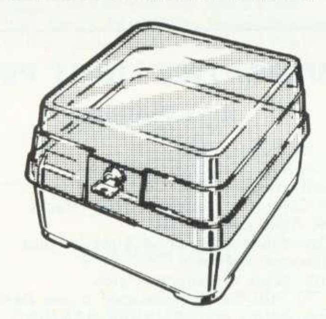
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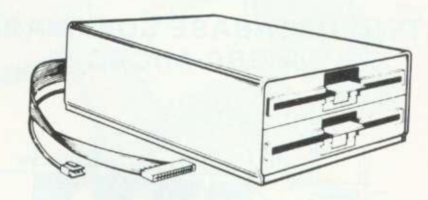
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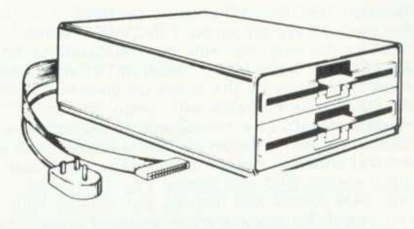
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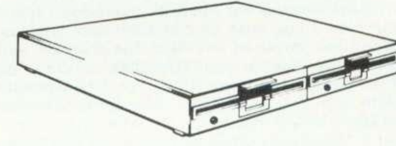
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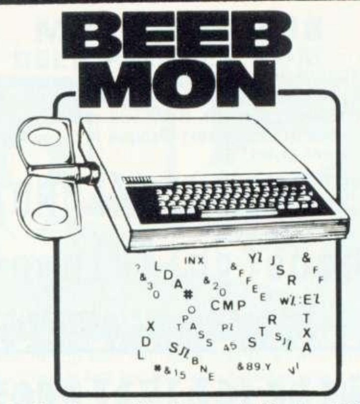
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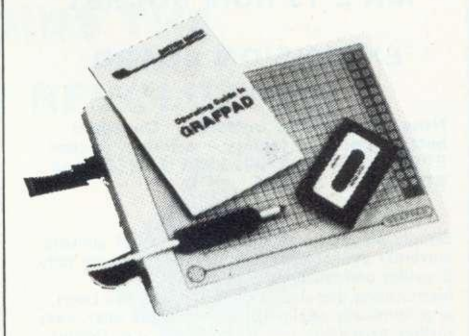
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Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. This board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, etc. (At Watford, we think ahead.)
Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)
The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.
All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.
Supplied ready-built and tested complete with fitting instructions.

ONLY £32.50 (carr. £1)

Versatile **BEEB SPEECH SYNTHESISER** Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!
PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!
BUILT-in Library of approximately 500 words to get you started.
ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.
EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!
COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.
HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £44

THE ULTIMATE DFS FOR BBC MICRO

by

Watford Electronics

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*
A very worthwhile package – *The Micro User*
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Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

PRICES:
DFS (Disc Filing System) ROM **£29**

Complete Disc Interface Kit including DFS ROM & Fitting instructions £99

Disc Filing System Manual. Comprehensive and clearly written £7.50 (no VAT)

P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for **£25**

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

EPROMs & CMOS RAMs

2764-250nS (8K ROM)	**£5.95**
27128-250nS (16K ROM)	**£24.00**
6116-150nS (2K RAM)	**£6.00**
6264-150nS (8K RAM)	**£32.00**

BEEBFONT ROM

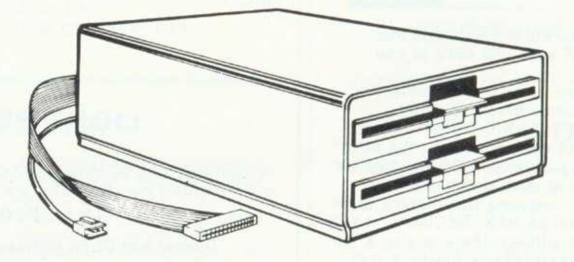
BEEBFONT is a remarkable new concept in BBC software, exclusively available from Watford. Once fitted, the 16K ROM will enable you to produce attractive text displays in following different styles:

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP
ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP
ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP
ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP
ABCDEFGHIJKLMNOP

★ **It works in modes 0, 1, 2, 4, using full colour.**
★ Simply use Ctrl–V to select the font and all further screen output will be in a new style.
★ Even the ordinary Beeb character set can be enhanced by doubling height or width and emphasising to give bold print.
★ A comprehensive editor is included which enables the user to design his own characters.
★ A spooling program is provided, which enables pre-formatted text files to be displayed on an EPSON FX, RX, and NEC Printers, using the full range of character styles. (Please specify printer type when ordering). Can be used with WORDWISE.
★ This really must be one of the most original and exciting products of the year.
★ A twenty page manual is provided and the demo/editor software comes on disc or cassette (please specify when ordering). **ONLY £39**

SPECIAL DISC DRIVE OFFER

NEW SLIMLINE, $5\frac{1}{4}$", CASED WITH CABLES



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CLD200 TEC, Twin 200K, 40 track, Single Sided **£225**
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(Carriage £5 securicor, insured)

WATFORD'S BEEB PRINTER ROM


"Makes Printing Childs Play"

Are you fed up with not being able to unravel your printer manual and use all those features you paid for? Need sensible paging for use in the creation of booklets? Then you certainly need our Beeb Printer ROM.

A machine code printer utility in ROM.

- 'Single' key operations replace control code sequences for underline, font and size selection, paper movement, etc. Up to 30 come pre-defined, without effecting normal fn key usage.
- **This rom allows easy control of your printer from 'Within' WORDWISE text. Instead of long escape sequences, you just 'OC' a single number to Select, Underline, Print Styles, etc.**
- Automatic fanfold page margins. Puts gaps in listings. PRINTed text etc to skip the folds. The gap size alternates to minimise paper wastage when using binders.
- Form feed and related commands, made available on ALL printers. Can also provide a left margin.
- User defined characters embedded within text are printed as on VDU.
- ★Commands select option for GP100, STAR, NEC, MX/FX, LP VII/DMP100, DMP200. Operates with Parallel and Serial Printers.
- Fully functional with the popular WORDWISE wordprocessor.

Supplied complete with a comprehensive 50 page manual.

Price: £24

(When ordering, please specify printer type)

DUMPOUT 3

A highly sophisticated machine code ROM providing screen to printer dumps in any mode, plus window setting utilities and two new OSWORD calls that allow you to use the Beeb graphic coordinate system for plotting or testing mode 7 'pixels'.

*GIMAGE Ultra sophisticated dump of any graphic screen, using up to 8 tones. Handles **FULL MODE 7 text,** graphics, double-height and colour and mode 8. 14 optional parameters, using 'prefixing' so that you only need specify the ones that you want. The parameters include:

- V<scale>, H<scale>. These are both 2 byte numbers giving you very fine control over the dump size from minute to enormous. Unlike other dump Roms, scale does not vary with screen mode.
- R <0-3> Dump rotation 0, 90, 180, 270 degrees.
- I<indent> Set gap from left edge of paper.
- X <min> <max>, Y <min> <max>. The area of the screen dumped is that in the graphics window, alternatively these parameters may be given.
- P Physical colour values used for dumping. (Otherwise use a negative scale, i.e. white prints darkest.)
- T Two tone dumps for higher resolution.
- M <mask> 8 bits controlling colour masking.
- E Contrast expansion. Makes mode 7 text characters and separated graphics stand out more clearly from the background.
- C All mode 7 graphics printed as reduced size dumps.
- *GWINDOW Draws graphic window on screen, its size and position can then be altered using the cursor keys.
- *TIMAGE <indent> Does a fast, text only dump of the text window in any mode.
- *TWINDOW As GWINDOW but for text.

DUMP OUT 3 gives you ALL of the GIMAGE facilities listed above and GWINDOW in mode 7 as well, not just hi-res modes.

Ideal for CP80, GP80, DP100, GP250, STAR, KAGA/TAXAN, NEC, SHINWA, CP80, GEMINI, EPSON MX/RX/FX, LPVII, DMP100/120/200/400 Printers.

Comprehensive Manual included. Only: **£19**

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MODEM 84

APPROVED for use with teleco... ...on systems run by Briti... ...munications in accordan... ...e conditions in the instru...s for use.

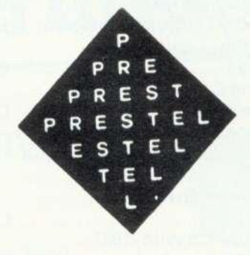
With the launch of Watford's MODEM 84 you can now hook into PRESTEL, MICRONET, HOMELINK, TELECOM GOLD, etc., for about the cost of a good tape recorder. Prestel gives you access to an incomparable database covering almost every subject under the Sun. There is Micronet with lots of free programs that you can download and run. Details of Clubs and User groups, a diary of meetings and exhibitions, news and reviews, technical information, etc. There is Homelink with On-line banking. And there is armchair shopping, travel information, Entertainment, World News, Sports News, Business News, Weather information, Electronic mail and lots more. The basic Prestel subscription is only £5 per quarter for domestic user and at off-peak times there is no charge for access time. Can you afford not to be part of this revolution?

Now using the latest techniques and the new generation of Modem chips, Watford have developed a Modem that is newer, better and yet cheaper than any on the market.

Compare the Specifications:

MODEM

- Direct-connect Modem using BT approved isolation components.
- Full Duplex V23 operation for Prestel and TELECOM GOLD operation (1200/75 Baud).
- User-to-User half duplex 1200/1200 Baud operation with AUTOMATIC SEND/RECEIVE switch (BEWARE – most MODEMS switch manually between send and receive, which precludes the use of intelligent user-to-user software).
- Simple single button operation and comprehensive LED status display.
- Attractively finished. Sized to sit on the Disc drive.



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Fully compatible with Watford's MODEM 84 as well as with PRISM and most other Modems.

- Supports full Prestel Colour Alpha and Graphic Characters including Double Height, Flashing, Conceal/Reveal.
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- Telesoftware downloader included.
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- Print page options are ASCII only (i.e. with supression of Graphics) – fast and works with any printer – as well as a full graphics dump for the popular Epson printer.
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- All the above facilities available from Function Keys. An overlay is provided giving simple yet comprehensive guidance to the key functions.
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A specially designed Dump ROM for EPSON RX, FX and the new Kaga KP810 Printers. Will accurately DUMP all Screen modes including TELETEXT, GRAPHICS and DOUBLE HEIGHT. MULTITONE DUMPS are also supported. Simple single command (*SCDUMP) operation.

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Wordprocessor (New version) **£52**

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This superb (FIG FORTH) compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Manual included. **£33**

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These Attache Carrying cases are attractively finished in mottled antique brown leatherette. An ideal and very safe way to carry your BBC Microcomputer. Price: **£12** (£2 carr.)

This space reserved for our 'Launch of the Year' Hardware.

– to be unveiled at the Electron & BBC Micro User Show, Alexandra Palace – July 19-22.



VOLTMACE'S DELTA 14 Hand-set

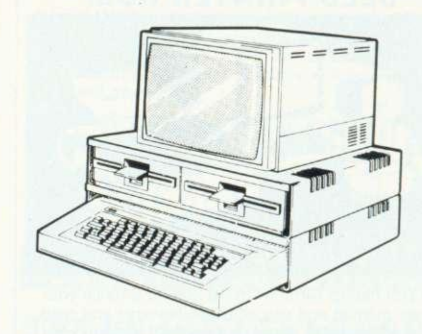
Price: 'Delta 14' Hand set	£12.50
ADAPTOR MODULE	£12.55
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Two versions available:

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Protect your micro from the weight of the heavy TV/Monitor. This sturdy plinth is attractively finished in BBC colour. Air vent slots have been provided to allow maximum air circulation. It can be used to support a monitor or a printer. The micro slides underneath comfortably. A must for every BBC Micro owner, specially for those who have to move/open their computer frequently.

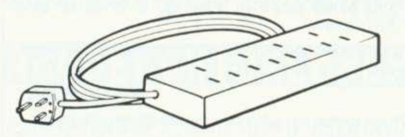
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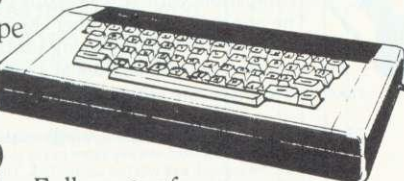
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IBM compatible, 128K RAM, 2 x 320K Drives. Price includes: Perfect Writer, Perfect Speller, Perfect Filer and Perfect Calc, plus 12 months on site warranty (monitor available at extra cost). **£1437**



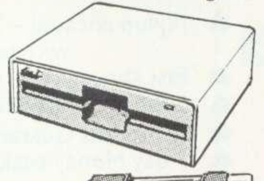
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80% IBM compatible, 128K RAM, 2 x 160K Drives. Price includes: Wordstar, Mailmerge, Info-Star and Calc-Star. Limited number of SAGE Accounts still available.
(Monitor available at extra cost) **£1148**



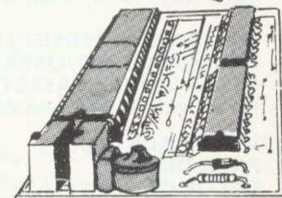
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Includes free software tape

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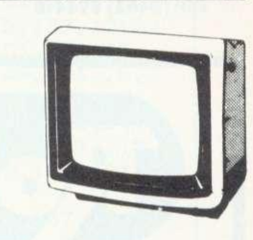
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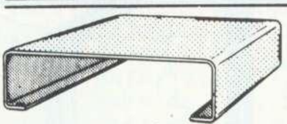
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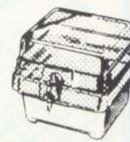
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SEE US AT The 2nd Official Acorn User Exhibition OLYMPIA 16-19 AUGUST 1984

I enclose my order for the above products.

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Address ____________

Signed ____________

SOUNDS INVITING

THIS month's musical interlude is provided by Welsh wizzards Gary Pesticcio and Darran Bristow. *The Brook, Riding* and *On the Lake* were written for the BBC micro (model A or B), but both will run on the Electron, though they will not sound as good because of the limited sound capability on the Elk.

For readers who aren't familiar with music, we've annotated the listing, and two more tunes are given on yellow listing page i. Just type them in and RUN.

Lines 10 to 90
Program details. Title, date, authors and micro notes.

Lines 100 to 110
Select screen mode and choose blue background with white letters.

Lines 120 to 140
Print five carriage returns and print title and copyright message on the screen.

Lines 150 to 160
Set number of data items to read with FOR . . . NEXT loop, then read three at a time into the variables A, B, and C.

Lines 170 to 190
Define envelope and sound parameters. The envelope 'shapes' the sound, while the SOUND command dictates how it is played.

Lines 200 to 340
150 data items to be read into the variables A, B and C. These are used as arguments to the SOUND pitch and duration parameters.

Take care when entering data statements, as many are decimal values less than 1. These are entered in the listing as point values only, with the leading 0 omitted: thus the value 0.5 has been entered as .5. If, on running, an 'Out of DATA' error message is generated you have almost certainly missed some items out of the data lines.

A way to help check your listing is to first set the column width to 40 before LISTing it using

WIDTH 40

This will now produce the same listing width as used in our printed version. The erronous line can normally be found quickly by comparing the edges of your listing (printed or on the screen) with ours.

```
   10 REM ****  THE BROOK  ****
   20 REM ** (C)  Acorn User **
   30 REM *** August  1984  ***
   40 REM * by Gary Pesticcio *
   50 REM * &  Darran Bristow *
   60 REM *** for BBC Micro ***
   70 REM ** will run on Elk **
   80 REM ** but won't sound **
   90 REM ** as good !       **

  100 MODE 6
  110 VDU 19,0,4;0;0;

  120 PRINT'''''
  130 PRINT SPC(12)"THE BROOK"''
  140 PRINT SPC(10)"(c) Acorn User"

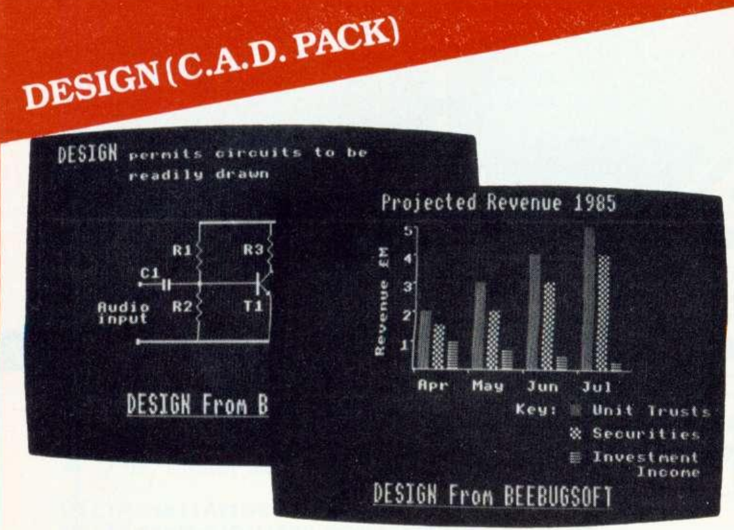
  150 FOR N=1 TO 151
  160 READ A, B, C

  170 ENVELOPE1,8,0,0,0,0,0,0,121,-10,-5
,-2,120,120
  180 SOUND1,1,A-12,C*10
  190 SOUND2,1,B-12,C*10

  200 NEXT N
  210 :
  220 REM ** sound data **
  230 DATA129,129,1,149,117,.5,149,101,.
5,149,117,.5,149,101,.5,129,117,.5,129,1
01,.5,129,117,.5,129,101,.5,137,121,.5,1
29,101,.5,137,121,.5,149,101,.5,129,117,
.5,129,101,.5,129,117,.5,129,101,.5
  240 DATA137,121,.5,137,101,.5,137,121,
.5,137,101,.5,145,109,.5,145,101,.5,145,
109,.5,145,101,.5,149,117,.5,149,101,.5,
149,117,.5,149,101,.5,129,117,.5,129,101
,.5,129,117,.5,129,101,.5,149,117,.5,149
,101,.5,149,117,.5,149,101,.5,129,117,.5
  250 DATA129,101,.5,129,117,.5,129,101,
.5
  260 DATA137,121,.5,129,101,.5,137,121,
.5,149,101,.5,129,117,.5,129,101,.5,129,
117,.5,129,101,.5,137,121,.5,137,101,.5,
137,121,.5,137,101,.5,145,109,.5,145,101
,.5,145,109,.5,145,101,.5,149,117,.5,149
,101,.5,149,117,.5,149,101,.5,149,117,.5
  270 DATA149,149,1.5
  280 DATA145,109,.5,145,101,.5,157,121,
.5,157,101,.5,149,117,.5,149,101,.5,149,
117,.5,149,101,.5,145,109,.5,145,101,.5,
157,121,.5,157,101,.5,149,117,.5,149,101
,.5,149,117,.5,149,101,.5,137,109,.5,129
,109,.5,137,109,.5,145,109,.5
  290 DATA137,109,.5,145,109,.5,149,109,
.5,137,109,.5
  300 DATA149,129,.5,149,129,.5,145,129,
.5,145,121,.5,129,117,.5,129,109,.5,149,
117,.5,149,101,.5,149,117,.5,149,101,.5,
129,117,.5,129,101,.5,129,117,.5,129,101
,.5,137,121,.5,129,101,.5,137,109,.5,149
,101,.5,129,117,.5,129,101,.5,129,117,.5
  310 DATA129,101,.5
  320 DATA137,121,.5,137,101,.5,137,121,
.5,137,101,.5,145,109,.5,145,101,.5,145,
109,.5,145,101,.5,149,117,.5,149,101,.5,
149,117,.5,149,101,.5,149,117,.5,149,101
,.5,129,117,.5,129,101,.5,137,121,.5,149
,101,.5,137,121,.5,149,101,.5,145,109,.5
  330 DATA145,101,.5,145,109,.5,145,101,
.5
  340 DATA149,117,.5,149,101,.5,149,117,
.5,149,101,.5,149,117,.5,149,101,.5,129,
117,.5,129,101,.5,137,121,.5,149,101,.5,
137,121,.5,149,101,.5,145,121,.5,149,121
,.5,157,121,.5,145,121,.5,157,121,3,149,
117,2
```

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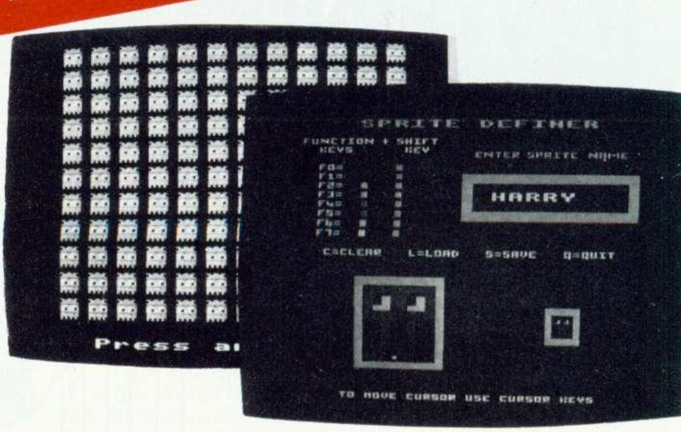
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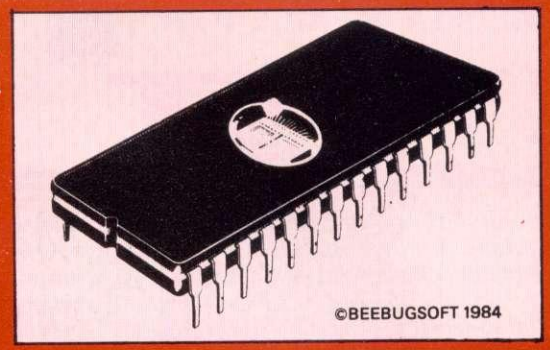
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*EDIT	Enter full screen editor.
*FREE	Display free memory and pseudo variables.
*HELP INFO	Display a screenful of useful system information.
*MEMORY	Display memory contents.
*MERGE	Merge a program in memory with one on disc/cassette.
*MOVE	Move program to run at specified address.
*NEW	As NEW, but can be issued from within a program.
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Martin Phillips offers his advice on second disc drives, lists commands for Epson printers and an answer to error messages

£5 Doubling up with a second disc drive

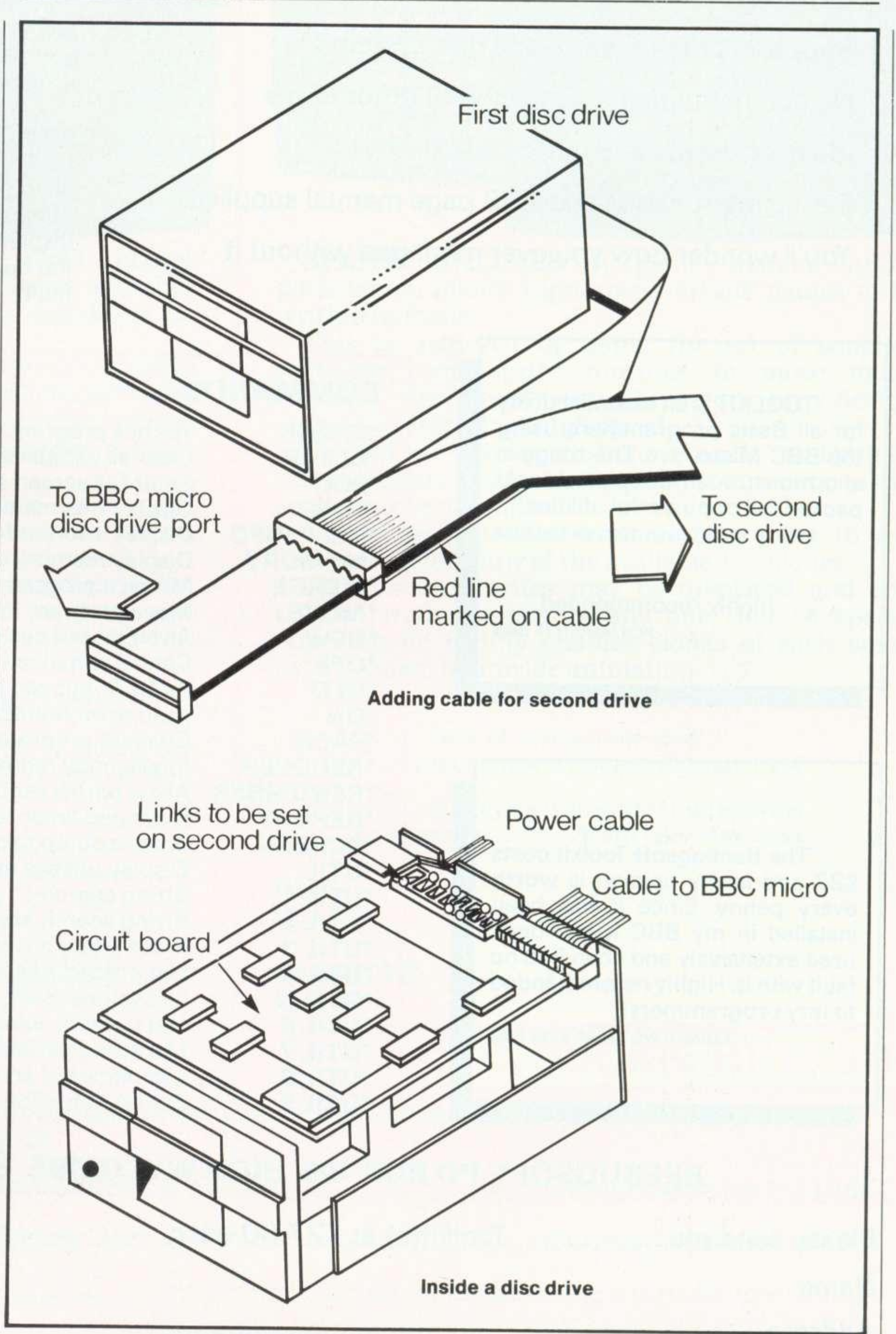
BUYING a second disc drive was the subject of a letter from Mr N Smith from Stoke-on-Trent which wins him £5. He asked if it was possible to add a second drive to his single 40-track, single-sided drive (5¼in discs). The answer is yes, it is easy to do. The connections are straightforward, and only some links on the disc drive circuit board need changing for both drives to be accessed.

The major problem is one of power, unless both drives have their own supply. If the single drive runs from the BBC's power supply, then a second drive can be run from that too, but be warned, this is getting near the limit of the capabilities of the system. The easy answer is to buy a second drive with its own power supply.

The other alternative is to look at the adverts for suppliers of a single drive with power supply in a case designed to take two drives. Here readers should be aware of sizes. There are two 5¼in drive sizes, full-height and half-height, and you can do this only with the half-height drives. These are about 4-5cm high, not including the case. I, in fact, bought a single drive in a double case, then bought a second drive when funds permitted.

The second drive can be 40 or 80-track, single or double sided and may not even be the same make, although this is advisable.

Once the power supply has been sorted out, the ribbon cable from the BBC's disc port to the drive needs to be altered to take the second drive. A second ribbon cable can be fitted on the first without breaking the connections using a Scotchflex 3365/34 or Amp 1-585717-5 connector. This can be fitted anywhere on the ribbon cable, but work out the best place for yourself *before* you actually do it. The new connector is put over the first cable, the top is put on



Adding cable for second drive

Inside a disc drive

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

and the assembly squeezed together in a vice. If you have first disconnected the second cable from its drive plug it back into the edge connector on the disc drive circuit board. The colour marker on the cable should be to the right looking from the front of the drive when fitted, but check which way round the cable is in the original drive. As an alternative, a cable can be purchased with two connectors to suit a double drive.

Next, the links need to be set on the second drive's circuit board. These are sometimes in the form of a row of switches, or else a series of small links similar to those on the BBC circuit board. The common types of drive available are Mitsubishi, Tec, Teac and Canon, although more makes are coming onto the market.

There are two sets of links on the Mitsubishi board. Looking from the front of the unit, they are both situated at the far right-hand side near the edge connector. They are a series of pins with coloured jumper clips across pairs of terminals, and can be removed by lifting the clips off the pins.

The link set nearest the edge connector and at right-angles to it should be connected as follows:

	Bottom drive	Top drive
DS0	link	n/c
DS1	n/c	link
DS2	n/c	n/c
DS3	n/c	n/c
MX	n/c	n/c
HS	link	link
HM	n/c	n/c

DS0-4 are the drive selects. These can be changed, but the two drives must have different numbers. It is usual to only use 0 and 1, as the reverse side of double-sided discs use 2 and 3 without any further selection. HM and HS stand for head-to-motor and head-to-select. Either could be selected, but the normal one is HS. In other words the read/write head will only engage the floppy disc when that head is required to communicate with the computer. This is noisier and slower, but reduces wear on the disc and head. Also, it is not so likely to corrupt a disc if the unit is switched off with the disc still in place. The Tec drive does not have a head load solenoid, and so these links are not present. MX is the multiplexing link and should normally be unconnected. MX should always be left unconnected on the half-height drives but on the full height Teac drives this link is the wrong way round, and needs to be made. The half-height Teac drives have come into line with the other drives and do not require the link to be made.

The other set of links are the resistor terminator set. All floppy disc drives need to have the drive cable terminated by a resistor. If a second drive is being installed these resistors should be removed. On the Mitsubishi, they are a series of eight links in a row, near the other links, but on the Teac these resistors are in an IC-type package in white labelled BECKMAN. This package should be removed from its socket. On the Tec this resistor is also mounted in an IC-type package and can be removed from its socket. As most of the ICs are soldered directly to the board and not socketed, these resistor networks are quite easy to identify. They are very near to the edge connector.

Translating printer commands for Epson with Wordwise

AT THE request of *Dear Kitty* I include a list of printer commands for Epson printers being used with Wordwise (table 1). The printer manuals have to be written for a variety of computers, and as such need some translation for the BBC micro. Readers with other printers will no doubt find the codes very similar as there is quite good standardisation here.

If using the older Epson printers it might be necessary to include a 1 before each command (eg OC1,27,1,69). This will be necessary if using these commands with VDU statements for inclusion in programs (eg VDU1,27,1,69). The commands listed here are the ones I use most frequently. This list pinned up near the computer saves much time and effort.

```
OC14          Double width (one line only)
OC20          Cancel double width (one line only)

OC27,87,1     Double width
OC27,87,0     Cancel double width

OC27,52       Italics
OC27,53       Cancel italics

OC27,51,72    Double line spacing
OC27,50       Normal line spacing

OC15          Condensed mode
OC18          Cancel condensed mode

OC27,80       Pica mode
OC27,77       Elite mode

OC27,82,X     Alternate character set
              (English..X=3, American..X=0)

OC27,69       Emphasised printing
OC27,70       Cancel emphasised printing

OC27,71       Double-strike mode setting
OC27,72       Cancel double-strike mode

OC27,78,n     Skip-over perforation setting
OC27,79       Cancel skip-over

OC27,45,1     Underline mode
OC27,45,0     Cancel underline

OC27,83,0     Superscript on
OC27,84       Superscript off

OC27,83,1     Subscript on
OC27,84       Subscript off

OC27,64       Initialise printer. (reset)
```

Table 1. Translation commands. A list kept to hand saves time and effort

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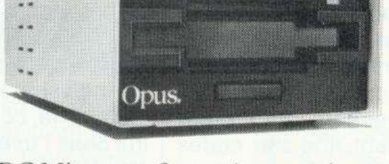
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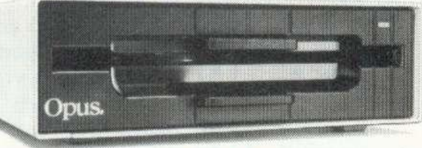
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A brighter way of changing background colour

ANDY HOLLIS from Exeter has sent in a simple tip to change the background colour when listing programs. There are several ways this can be done, but the way suggested is particularly neat and quick.

Keep the CTRL key pressed and press the keys:

V6SBA000.

This will get mode 6, and turn the background colour to red. Then the printing on the screen will appear in white with black between each line of print. This makes it easier to debug listings. Other background colours (including the flashing colours) can be obtained by changing the 'A'. For instance, 'D' will give a blue background.

This method of changing the background colour and mode cannot be used in programs, and the programmer will need to use the VDU statements in their more normal form.

Two techniques for turning the cursor off

SOME months ago, one of my more learned friends peered over my shoulder at a program I was writing, and exclaimed 'You're not still switching the cursor off like that! Haven't you seen the new command?' I almost gave up programming on the spot. However, I have since found that the 'old' method of switching the cursor off can sometimes be used to advantage over the newer method.

There are two ways of turning the cursor off with the BBC, and although one is not in the Electron manual, both work just as well on the Elk.

The one given in both user guides is:

Cursor off: VDU23, 1,0; 0; 0; 0;
Cursor on: VDU23,1, 1; 0; 0; 0;

The BBC guide also says the cursor can be switched off another way:

Cursor off: VDU23;8202;0;0;0;

This latter method produces an interesting character on the screen. It turns the character to be copied the inverse of itself. However, it does have more uses and is more robust. The former command can be switched on again using VDU4 as well as the command given above. The only way to switch the VDU23;8202 back on is to change mode.

If you are writing a program that requires the text and graphics cursors to be joined and separated repeatedly (VDU5 and VDU4), then the latter method for switching the cursor off using VDU23;8202 is the better one to use as it needs to be used only once in the program (unless the mode is changed).

Diagnosing listings

Martin Phillips goes through some useful techniques to use when you find a program you've typed in doesn't work.

Turn to First Byte on page 33.

How to avoid memory problems when switching from cassette to disc

WHY should programs that would run on cassette start giving error messages like 'No room' or 'Bad mode' on a disc system? asks Mr Winterton. Some programs seem to 'stick' when they get to the menu page and go no further.

The reason is that when a disc filing system (DFS) chip is fitted to a BBC computer it needs some memory of its own to store information. This workspace is just under 3k long, and it is taken from the memory normally used for programs. When the computer is switched on or break is pressed, the DFS grabs its workspace and moves PAGE, the position at which the user's program is loaded. On a cassette machine, PAGE is set to &E00, but on a disc machine this is moved to &1900. (Econet and teletext similarly grab some of the memory for their workspace if fitted.)

The problem experienced by Mr Winterton usually occurs in programs that use graphics and it is when a mode change occurs that the program now finds that it has not enough memory left, hence the 'Bad mode' error. Sometimes a program has an error routine that sends the program back to the menu or title page if an error occurs.

In this case, the program will appear to cease functioning and remain at the menu or title page with the only option being to press the break key. If one then removes the error routine, the program will usually respond with the 'Bad mode' or similar error.

What can be done? Provided that there is enough memory space to load the program in from disc, then once loaded the program can be moved down in memory to start at &E00. Once this has been done the computer will think it is a tape machine, and so will be unable to then load a data file from disc. Also, pressing break will give a 'bad program' message, and the program will have to be reloaded from disc.

A short routine is shown in listing 1 which will move the program down in memory and then re-run it. This listing can be *SPOOLed and then added to the program in question by using *EXEC with the program loaded in the machine. Then the program must be re-saved on disc before it is run. Do check that the program does not use lines above 30000 or uses line 0. If it does, renumber it first. The routine uses line 0 to test if the program is loaded above &E00, and only relocates it if it is. Line 0 is used, as it is rare for a program to start here and so it is unlikely to overwrite any original program lines.

```
    0 IF PAGE>&E00 GOTO 32000
32000 *TAPE
32010 FOR I%=0 TO TOP-PAGE STEP4
32020 I%!&E00=I%!PAGE:NEXT
32030 ?&13=?&13-(PAGE-&E00)DIV256
32040 PAGE=&E00:RUN
```

Listing 1. Shifts program down in memory




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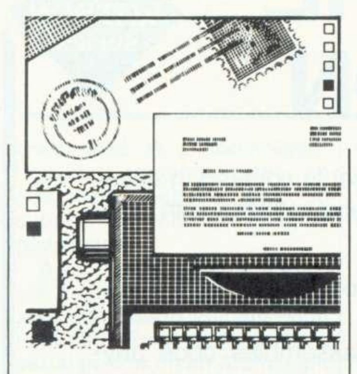
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Overwhelmed with software

Sir, Having read the review of Acorn's Z80 second processor, I wonder whether Acorn has 'scoured the world' for a 'rag bag' of software that will leave most serious users thinking where do they go next.

Acorn's marketing strategy seems to be to overwhelm potential customers with the sheer weight of software. Indeed one suspects that there is more paper in the package than electronic circuitry – so much for the paperless office!

One cannot help but think from the size of the software bundle, with its 11 separate items and high valuation of £3,000, that there is some desperation on the part of the software houses to sell their products, hence the enormous giveaway. It is interesting to note that not many of the more widely known products are being offered in the package, although some are mentioned as being suitable in your Q/A session.

Your brief description of the software seems to raise more questions than it answers. *Nucleus* looks very flexible, but why the need for *FilePlan* and does the latter then require the purchase of *MailPlan? MemoPlan* would seem to be a comprehensive word processor, although there is again the suggestion that a further package will be required to make the best use of it.

However, alongside it, *GraphPlan* looks positively crude, despite its colour graphics. With 50 x 20 cells, the latter is smaller than the cassette-based *Beebcalc* from Gemini. It has no split screen facility and does not appear to cater for linked worksheets such as those provided by *Multi Plan* from Microsoft. Finally, what use is a graphics package that is not actually used by any of the bundled software?

I would have preferred a fully integrated suite of programs offered, which seems to have been the Torch and Sinclair approach, or, better still, a choice of suites for say small business applications, financial analysts, the serious programmer or scientific and technical applications.

Perhaps when you do a full review of Acorn's Z80 software, you could also do a comparison with the offering from Torch.

One question for Torch – is CP/N really fully compatible with CP/M and, if so, why needlessly confuse the potential customer with different terminology?

Robin A Richmond
Leamington Spa
Warwickshire

Second processor problems

Sir, Having just purchased the 6502 second processor I find that *none* of my paged ROMs will work with it switched on, eg I am totally unable to use: *Wordwise, Graphics, Exmon, Micronet, Commstar, Toolkit* unless I have the second processor switched off!

It seems that Acorn has 'conned' me into believing the second processor is the best thing since sliced bread. Maybe it is, but having it is proving to be totally useless when one considers the usefulness of the above ROMs.

I suppose the suppliers of these ROMs may decide to rewrite them for the likes of me. I only hope they will take the existing ROMs in exchange, because having spent £200 on the second processor I'm not willing to spend around a further £150 to upgrade all the ROMs.

Also, when operating in Mode 7, why have I not got 71k of memory available? (26k from the existing BBC 'B' plus 45k from the second processor).

Will someone please explain why, with the second processor (operating in Hi-Basic) I have only gained 19k (45k–26k) and *not* a full extra 45k as mentioned in the second User Guide?

If, on switch-on, the original BBC 'B' Basic ROM is copied into the second processor, what's happened to the original 26k that I was able to use? The second Guide, chapter 9, 'Distinguishing between Memories' is no help in saying 'suppose you run a machine code program . . .' Suppose you *don't*. How do I recover the original BBC 'B' 26k of memory?

Anyone want to buy a brand new 6502 second processor?

I Crawford
Banbury

Difficult times Down Under

Sir, As tales of would-be Electron owners lining up on cold December mornings to purchase their very own 'Cambridge Cabbage Patch Dolls' reach us in Australia (yes, the computer magazines are that far behind), I would like to tell the story of my own little Acorn, and maybe cheer up those who thought they were badly done by.

Firstly, no Aussie computer magazine mentioned the arrival of the Electron in this country. Everyone here buys either Commodores or Apple lookalikes. The Beeb has been available for some time, but its price has kept its numbers down. (The current Australian price is equal to just over £1,000.)

I'd read about the Electron in some English journals, and was on the verge of ordering one from England when I noticed that a Sydney Computer shop had them in stock. Expecting a rush, I hurried over.

Not only were there some left, none were yet sold. In fact the dealer said he was having a hard time getting people to look at them, let alone sell any.

So I bought one.

Now I have no gripes about the machine itself. I have no need to sing its praises in your magazine. Even the interfacing (or the lack of it) has posed no problems. But don't talk about support . . .

Despite searching some six Acorn dealers (one of whom didn't know it was even though the distributor gave me its name and address), no Electron sofware was available. In fact this is still the situation some two months after buying the machine. The dealers told me to contact the distributors who said that they didn't have any and to contact the dealers.

The results was that the Acorn Electron must be the only computer on the Australian market with no software support, and considering the number of Asian imports we get, that's not a bad effort. The available BBC programs are very limited, and not always compatible.

So I am left with a superb machine, an introductory cassette, and a pile of Pommy magazines with BBC and Electron listings.

I would like my full name and address to be printed so that any enterprising UK companies might like to let me know what they have for the Electron. And when I order software, don't bother with copy protection, because there's nobody else Down Under to even give the stuff to!

Earl White
5 Leopold St
Croydon Park 2133
Sydney, NSW
Australia

Second success with Ultracalc

Sir, On page 84 of your May issue, Clive Williamson says that our spreadsheet 'Ultracalc' does not work with the second processor. It does! I have had it running on the other side of the Tube where about 5k extra memory is gained on a disc system.

David Atherton
BBC Publications
London W1

Serial printers and the Atom

Sir, Way back in January '81, I purchased an Acorn Atom. Since then I have expanded it to 96K (at present) of which 42K is ROM; incidentally, I have been using 'sideways' principle since 1982; during this time I have discarded the original case, and changed the keyboard in favour of what was once an old Univac keyboard, so now I don't need to press shift to get punctuation.

Also, the old PCB did not lend itself to much modification so I rebuilt the circuit on plain RBP and used verowire.

I have rewritten the original ROM to give me 15 ports (inc ROM/RAM switching) between #B040 and #B3FF and a text start at #0C00 plus a few other uses.

The whole shebang is housed in a metal cabinet

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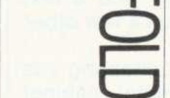
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once used as a compressor housing, together with an automatic battery back-up supply to alleviate mains power cuts.

As a little diversion, may I point out that on page 121 of your June issue Vincent Fojut is totally wrong as to using a serial printer on an Atom; I am currently using an ITT Envoy printer, and have used Creed 7B teletypes, both of which are serial formats.

Anyway my question is one of name. Is my machine an Acorn Atom or not?

N J Tubb
Crawley
Sussex

PS. If you are wondering about the FP using #2800, I've also rewritten that to use #0B00 instead.

Vincent Fojut replies: I actually said that 'a serial printer cannot be used *directly* with the Atom.' That is, unlike the Beeb, you cannot plug a serial printer straight into a standard, unmodified Atom, and expect it to work.

This is not to say that it's impossible to drive a serial printer from the Atom – but you must develop (or purchase) additional software and/or hardware to make things work, as you will undoubtedly know from your own experience.

Other readers, who don't want to do the work themselves, may like to know of the Disatom utility ROM by Procyon. Amongst other things, this enables you to use the Atom's cassette port as an output driver for serial devices. Contact: Focusplan, 57 Westgate, Cleckheaton, W Yorks BD19 5HH.

Misleading test programs

Sir, I would like to correct a misunderstanding about the relative speed of using GOSUB or PROC on the BBC computer and Electron in Gary Smallridge's article 'Basic increase in speed and space' (*Acorn User* June). In this Mr Smallridge states that using GOSUBs is faster than using procedures, contrary to the statement in the *User Guide* (page 195). He gives a program that proves this.

Unfortunately, this type of test program is misleading because of the different way the interpreter handles the two types of routine call. For GOSUB the interpreter searches through the program from the start until the destination line number is found. The time taken depends on the position of the routine in the program. For a short program like the test the GOSUB call can be quite fast, but as the program becomes longer the speed deteriorates rapidly. In contrast, after the first reference to a procedure the interpreter 'knows' the location of the procedure definition and can call it directly without having to search. This means that in practice procedures will be much faster.

A more realistic test program that demonstrates this is given in figure 1, with results for varying program lengths. For programs where the subroutines are beyond the fifteenth line procedures are faster and for longer programs the difference becomes substantial. The speed of a procedure call is essentially independent of the size of the program.

Robert Tidey
Middlesex

```
10 TIME=0:FOR I%=1 TO 1000:GOSUB 10000:NEXT
15 PRINT TIME/100:STOP
100
101
102
........Variable number of lines containing one space

10000 RETURN
20000 DEFPROCA:ENDPROC
```

Number of lines	GOSUB	PROCedures
1	0.46	0.69
5	0.52	0.69
10	0.60	0.69
50	1.18	0.69
100	1.92	0.70
500	7.8	0.70
1000	15.16	0.70

```
10 INPUT "NUMBER OF LINES",NL
20 PAGE=PAGE+&100
30 FOR N%=100 TO NL+99
40 !I=&5000000+(N%MOD256)*&10000+(N%DIV256)*&100+13
   :I?4=32:I=I+5
60 NEXT N%
70 !I=&FF0D
```

Figure 1. Robert Tidey's program (top) for testing execution of GOSUB calls. To test PROCedures replace GOSUB 1000 with PROCA. The results for different numbers of program lines are shown. The other program was the one used to create the dummy lines in the test program

Undocumented op codes

Sir, The suggestion that certain undocumented 6502 op codes are 'newly discovered' (Atom Forum, June) is somewhat wide of the mark.

Several articles have appeared on this subject, the earliest I can find being in Byte as far back as December 1977!

However, full marks to Barry Pickles for resurrecting the subject and for producing a very useful table.

It should be noted that the 65C02 (plug compatible with the 6502) does use some of these, including all the x7 and xF codes.

Finally, has anyone installed a 65C02 in one of the Acorn machines?

Geoff Smith
Worcester Park
Surrey

When experts are in error

Sir, I am saddened to see an otherwise excellent magazine spoilt by the inclusion of articles which contain statements that are inaccurate and in some cases simply incorrect, particularly when these articles are written by professional programmers to help the 'less adept' amateur. In particular, Gary Smallridge's article in the June issue contains several such errors.

In section 7 he advises users not to 'start variable names or procedure names with the same letter'. While this is excellent advice for variable names, it will have no effect on procedure or user-defined function names. This is because of the way these are stored in memory. The Basic interpreter has 28 linked lists for accessing these names, one for variables starting with each letter of the alphabet, one for procedures and one for user defined functions. It is faster to spread the variables between these lists but as procedures and functions have their own lists no gain is obtained with this technique.

In the section on saving memory he states that 'in BBC Basic a real number will use five bytes of memory whereas integers (eg, 1%, FRED%) will use only four.' In fact there are three types of numeric scalar variables (ie single numbers, excluding arrays). These are the resident integer variables, normal integer variables and real variables. The resident integer variables, as he points out earlier in the article, require no additional memory as they are already declared in reserved locations. Normal integer variables require the length of the name, including the '%' plus six additional bytes, four to store the value and two to store the pointer to the next variable starting with the same letter.

Although the first letter of the name is not stored but implied from the linked list in which the variable occurs, an additional zero byte is required as the terminator for the variable name. As such the variable FRED% would require a total of 11 bytes of memory. A real variable, as he suggests, does require an additional byte to store the value giving a total of the length of the name plus seven additional bytes. However, as there is no terminator on real variables, this saves one byte, giving the same amount of memory required for variables with the same name. A real variable FRED would still require 11 bytes of storage.

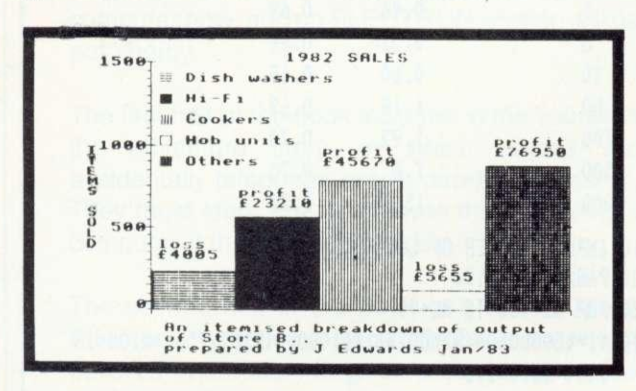
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No of prices stored	20,000	Appx 1700
Max no' of Holdings	20	20
Transactions per holding	16	16
Range adjuster	YES	NO
File Manager	YES	NO
Printer Manager	YES	NO
REPORTS PRODUCED:-		
Portfolio Valuation	YES	YES
Portfolio Profit Analysis	YES	YES
Share Profit Analysis	YES	YES
Share Movement Analysis	YES	YES
Transaction Record Report	YES	NO
File Status Report	YES	NO
GRAPHICS FACILITIES:-		
Magnification option	YES	YES
Grid	YES	YES
Autoscale	YES	YES
Screenwrite	YES	YES
Screendump	YES	YES
SELECTABLE GRAPHICAL INDICATORS:-		
Lagged Moving Average	YES	YES
Centred Moving Average	YES	YES
Rise and fall indicator	YES	YES
Weekly/Daily Low indicator	YES	YES
Superimpose Facility	YES	YES

There is only a saving in memory made when integer arrays are used instead of real arrays. In this case one byte is saved for every element in the array, less the extra byte required in the name.

Although I understand it is difficult to check the accuracy of the information in every article, I would like to state that this quality of writing tends to reinforce the opinion held by many people that so-called 'computer experts' have little more ability in the field than most people who have just bought a home micro but have not yet learnt the jargon.

Mark Simms
Bristol

Desk design

Sir, As a part of my 'A' level design course I am designing a computer desk/work unit with the home user in mind. At the moment I am investigating what form one of these units should adopt, whether it be an expandable system or a solid single unit.

As I will be designing, making and possibly selling the design of this desk, I would be very grateful for any ideas.

S Plenderleith
Kirkbie Kendal School
Lound Road
Kendal LA9 7EQ

Inspect bags

Sir, Unfortunately in editing my program, *Inspect*, which appeared in your July issue, a couple of bugs have crept in. Line 310 should read:

310 LDX #8

and line 640 should be:

640 LDA #8

To save a usable version, enter these changes and type *SAVE INSPECT 8D0 9FF and you should find that all will be OK.

M Clayden
Merseyside

Tape loader

Sir, The listings for 'Tape Loader' in *Acorn User*, June are not the final versions of the program. They contain at least one error and if the main program is 'pruned' as suggested in the accompanying article it may subsequently crash. The changes given in figure 2 should make the program run correctly and more smoothly.

John Bexon
Kent

```
LISTING 1.
 50 LOMEM=TOP+&80:
    TP%=TOP-1
 80 *KEY10 OLD:
    MEND:MRUN:M
320 R%=FNC(TP%)
630 RESTORE 1002:CT%=-1
    :CLS:PRINT''"Programs
    on this tape are:
    -"'':L%=FNC(TP%)
In line 750 instead of
KEY f0 use BREAK

Listing 2.
80 *KEY10 ?&218=&DC:
   ?&219=&D:?&20A=&D6:'
   ?&20B=&D:OLD:MEND:
   MRUN:M
```

Figure 2

High rollers

Sir, I have an idea to improve your magazine, that is if you can improve on perfection (creep, creep). It came to me (the idea that is), while reading B Nesbit's letter in your June issue. How about keeping a list of the highest scores achieved by readers at various popular games?

Mark Coles
Birmingham

A number of readers have written in to boast of their performance in various games. We list the high scores below to get the ball rolling. Record-breakers please write in.

Mark Coles				
Rocket Raid	**39,780**		**Meteors**	**22,980**
Snapper (keyboard)	**131,810**		**Chuckie Egg**	**1,048,820**
Danger UXB	**320,750**		**Pengo**	**35,790**
Overdrive	**55,210**		**Crazy Painter**	**55,240**
Stephen Green				
Android Attack	**602,590**		**Arcadians**	**27,300**
Starship Command	**2,059**		**Zalaga**	**111,930**
Robet Hirskyj				
Planetoids	**346,775**			

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

Kitty answers the simple questions that confuse many



Q Since we got our BBC micro, my husband never takes his hands off it from the time he gets home. I don't mind this, in fact it's nice to see him take such an interest in something. However, when I ask him what he's doing till the small hours, his answers are incomprehensible – I'm not even sure he knows what he's talking about.

Rosie Reynolds
Cornwall

A When I first got my BBC I also found myself absolutely engrossed – I had to put an alarm clock on top of the TV to remind me of just how much time was passing! The main thing about getting to grips with a micro is the splendid sense of achievement when you set yourself a problem and then manage to solve it in a logical way. Writing your first program which actually works is just like passing a driving test!

Q Most of my friends at work have got computers and seem to talk about nothing else. What use are home micros? When I ask what use they are, all I get are evasive replies – as if none of my friends want to admit that they are of no use at all. Can this be true?

Nicholas Spencer
London

A It all depends on what you mean by useful. As an aid to logical thought, yes, they are useful. However, a Beeb on its own (with no add-ons) is useless for so-called usefulness – it won't run the central heating or manage your household budget. That said, a lone Beeb is useful in that it gives you an interest and stops you watching so much TV; if you get involved in graphics it will brush up your geometry – it's also just plain fun.

If, though, you have some add-ons (printer or discs) then it can become a wordprocessor – and you'll never want to touch a typewriter again! It's also very handy for mailing lists and other time-consuming repetitive tasks.

Going one stage further, a Z80 second processor will turn your Beeb into a proper business system – accounts, stock control – virtually everything a small business could need.

Some of the articles in this issue may set you thinking about education, and teaching your children, which is something else a micro can do.

But remember, a computer for most people becomes an end in itself: it just replaces watching TV, or tinkering with cars, or doing crosswords.

Q Having saved up nearly five hundred pounds to buy a BBC micro and the bits to make it work, I was expecting not to have to spend any more. Little did I know that it would continue to be a drain on our holiday money. It seems my family will never stop wanting more software and add-ons! What I want to know is whether the micro is going to be a passing fad like skateboards or roller-skates?

Michael Fernandez
Dorset

A I just wish someone did know the final answer to this question! A home computer is certainly different from other toys; it doesn't have to be used just as a toy and there are plenty of useful things it can do.

Second, a computer is more like Lego or Meccano than a pair of roller-skates. You can build many different things around it and it is only really limited by the imagination of the user.

For the home computer to die out a better toy must come along: it's difficult to imagine a more versatile one.

The company which brought you the first self-build Arcade game and the first Adventure with sound, just had to be the one to give you the very first QUEST for the Beeb!

Swords and Sorcery

a new experience...

QUEST programs originated on the American mainframe computers, and were converted to micros, though requiring so much memory could only be made to work on expanded Apple micros and the like. Now, Kansas have crammed a full feature Quest into 32K, giving every BBC Micro owner the opportunity to play and experience these unique games.

So what is a Quest? Think of an Adventure, then think of very much more. A Quest is operated similar to an Adventure, but no longer are you alone, starting with three helpers. As you progress you will encounter many other characters, but unlike an Adventure program were all characters are passive, these can be either hostile, friendly or indifferent. If hostile you have to fight, and quickly; if friendly they may join your team bringing more strength, magical ability and carrying capability; if indifferent you could perhaps try a bribe (but beware if you offer too little) or you could sell an object and raise yourself more cash as well as lessening your load.

But most of the effort is your own, with treasure, money, magic and strength all having a bearing on your progress. At times it will pay to be vicious and abandon your friends as they become weaker, or even go in fighting before characters show their true colours, the element of surprise using less strength.

As can be expected in Swords and Sorcery there is a story:

Once upon a time in a far away land called Iriuma a magical Princess cast a spell of banishment on the wicked Sorcerer Brogfelt. However, just before the spell took effect, Brogfelt threw his arms into the shape of changing and cast a return spell, changing princess Illear into a diamond. Taking the diamond with him, Brogfelt took sanctuary in the Dungeons of Terror amongst the various monsters and demi-humans. Here he split the diamond into four parts and changed each part into a different crystal. Brogfelt then hid each crystal in the dungeons never to be found again. When the king heard of this he summoned all his faithful Knights to him and offered half his lands for the four crystals. Sadly they all perished in the Dungeons of Terror attempting it. Now the king has offered anyone his other daughter's hand together with half his lands. Hearing this, you set off to the king's palace to offer your services. The king is astounded but nevertheless offers you a party of three prisoners from his jail, promising them a full pardon if they will go and aid you. As you leave the king stops you and thrusts a scrap of paper into your hand explaining that it contains the location of each part of the crystal from the entrance of the dungeons. It was written very shakily and stained in blood. The king says: "Let me introduce you to the three prisoners that I have volunteered to go along with you..."

The characters you meet include a Troll, Orc, Thief, Dwarf, Goblin, Madman, Witch, Hobgoblin, Mad Monk and of course the wicked wizard himself, all in fact you would expect in a magical Swords and Sorcery...

All the objects have a use, but be careful, for picking the Dragons Tooth could be fatal; though if you find the Staff of Healing try and get it; an Idol of a forgotten God should be left well alone: the Ring may help you; the Magic Axe certainly will; the Old Book will give some clues; rub the Glass Ball; used properly the Magic Carpet will get you out of trouble; the Rolled Scroll too is useful; but not so the Fools Gold; be careful with the Bottle of Liquid; but drink the Magic Potion; treat the Golden Orb with care; but of course the Sword is the greatest help of all. And so it goes on, and on and on...

Unlike an Adventure game, were once you have solved the plot, and it is all finished for good, Swords and Sorcery generates an entirely different scenerio every time, even though totally logical! But if you really intend to see a game right through to the end, the game saving facility allows you to do this, playing the same scenerio, time after time, to its end. It is so different from an Adventure, that it actually has nine–yes nine– levels of play, with the ninth having so many locations and of such complexity, that we would be amazed if anybody ever solved it!

If you are an Adventure addict, this will really spoil you! If you do not care for Adventures the activity in this unique game will suit you as well. It is one of those you just will not be able to leave alone...

Though there are many Adventure games using the word Quest in their title, these are not Quests in this, the true sense of the word, but are just ordinary Adventures.

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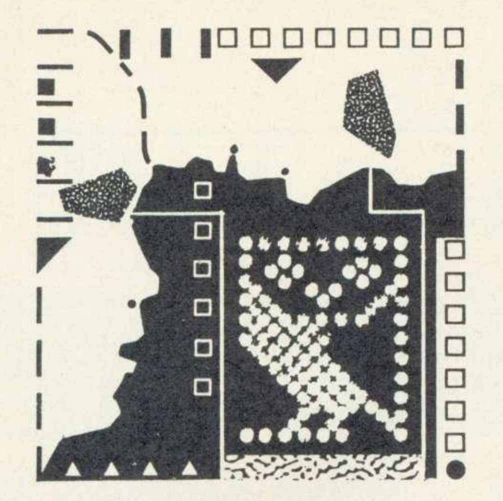
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Bruce Smith is in charge as readers chip in on legitimate access, printer toggling, file sizing, plus tips on Wordwise

£5 Access information without peeking or pokeing

THERE are three items, says Ellis Thomas, in January's Beeb Forum which, though apparently unconnected, have an underlying factor: the ability to access information legitimately without peeking or pokeing.

First, the cursor problem in 'Less Peeking'. The *Advanced User Guide* tells us (page 15) the codes placed in the input buffer for the soft keys, so the cursor keys can be driven from running programs by placing the relevant code in the input buffer to be acted upon, using *FX138,0,N (cursor editing must be enabled, of course, see *FX4). The relevant codes are:

&8F 143 ↑
&8E 142 ↓
&8D 141 →
&8C 140 ←
&8B 139 COPY

So we can not only position the cursor, but also do the copy from the running program, leaving the characters in the input buffer as if we had used cursor and copy keys from the keyboard. The only problem is that the starting point for cursor movement is that defined at the time of input (INPUT or GET$), not that at the time the codes are placed in the buffer. The example given can thus be replaced by listing 1. The prompt @? is followed by the copied string, awaiting modification by using delete, or addition of characters prior to input by pressing return.

```
1090REM by Ellis Thomas
1100DEFPROCCat
1110LOCAL C%: C%=0
1120Name$=""
1130*FX15,1
1140*FX4,0
1150*FX138,0,143
1160REPEAT
1170Name$=Name$ + FNCopy(" ")
1180C%=C%+1
1190UNTIL C%>=10
1200Rest$=""
1210REPEAT
1220Rest$=Rest$ + FNCopy(CHR$-1)
1230C%=C%+1
1240UNTIL C%>=39
1250ENDPROC
1300DEFFNCopy(Omit$)
1310LOCAL C$
1320*FX138,0,139
1330C$=GET$
1340IF C$=Omit$ THEN =""
1350=C$
```

Listing 2.

This brings us to 'Cassette space'. The table of addresses in memory page 3 is given in the *Advanced User Guide* (page 279). Here we see that we can use OSBYTE &A0 to access these values, which presumably makes us Tube compatible, and safe from this data being moved to another page in a new operating system. However, we are left with the problem of reliance on the layout within the page. An alternative approach is to read the file details from the screen using cursor and copy keys. Changes to the screen layout will at least be obvious to see in a new OS. Listing 2 gives an idea of how to read the file name and so on from the screen immediately following reading the file with *LOAD, using *OPT1,2. A call to PROCCat yields the name in Name$, and the addresses in Rest$:

Block No – MID$(Rest$,2,2)
Length – MID$(Rest$,5,4)
Load add – MID$(Rest$,13,8)
Exec add – MID$(Rest$,22,8)

The FNCopy enables us to omit a nominated character so that the trailing spaces on the filename can be easily avoided; use of GET$ avoids the copied characters being printed. Using these procedures, a utility to copy a cassette file automatically for back-up has been readily constructed.

Finally, 'Locked for program protection' had a problem placing the token for OLD in the input buffer. The reason for this is that the OLD token is &CB (203). When an attempt is made to place it in the input buffer, this behaves as &8B (139) which is copy, so no character is actually placed in the input buffer, the same as when copy is pressed without having pressed a cursor key. The set of codes appears to be repeated every 16 up to &FB – &FF.

```
10 REM Copy from running program
20 REM by Ellis Thomas
30 CLS: PRINTTAB(1,2)"ABCDEFG"
40 FOR X%=5 TO 3 STEP-1
50 REM Up cursor
60 *FX138,0,143
70 NEXT
80 REM Left
90 *FX138,0,140
100 FOR X%=1 TO 7
110 REM Copy
120 *FX138,0,139
130 NEXT
140 INPUTTAB(0,5) "@", A$
150 PRINTTAB(0,10)"Input
was""";A$;""""
160 END
```

Listing 1.

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

£10 Printer on, printer off

C BINSTEAD of Andover wins himself £10 for this useful machine code utility. We'll let him explain . . .

The interrupt routine in listing 3 (yellow page ii) will possibly be of more use to disc users than readers with cassette-based systems, although the latter may find use for it. PTRTGLR was originally written for use with the *DUMP statement to enable printer dumping of selected sections of the output.

page 70▶

SECONDS OUT

Robin Newman finds a way around trouble with the Tube

HAVING recently acquired a 6502 second processor, I have been finding out the hard way the validity of the warnings given by Acorn concerning the use of direct memory addressing in programs, which can make them unusable in a second processor. The problem occurs in any program which tries to do one of the following:

- Directly 'poke' or 'peek' the screen. This is now in the BBC machine (the input/output (I/O) machine) memory map, whereas the Basic program will be running in the 2P (short for second processor). You will be peeking or poking 2P memory with unpredictable results.
- Directly accessing the user VIA addresses. These are also now in the 'wrong' processor memory map.
- Using unofficial pointers like &F4 which contains the currently selected ROM identity. Note that using Basic pointers like &18 for PAGE and &12,&13 for TOP still appears to be OK (though undesirable?) as Basic maintains its pointers in the 2P memory map.
- Using programs which maintain data areas at &A00 or &C00. As the default value of PAGE is &800 in the 2P, this will cause these safe data areas to appear on top of the program, thus destroying it! Note that user-defined characters are still stored in the I/O memory map, as are function key definitions, so neither can be accessed by direct peeking using the ? operator.

What then can be done about these problems? Most are easily avoidable, albeit at the expense of slightly more involved programming. It *is* possible to directly peek or poke a memory location if you use the legal method. This uses OSWORD with A%=5 for peeking and A%=6 for poking. Examples are given in the 2P handbook, and these calls are also detailed in the *User Guide* (p460) and the *Advanced User Guide* (p249). To access the user VIA, or other devices in the FRED, JIM, and SHEILA pages of the I/O memory map, OSBYTE calls with A%=146 to 151 can be used (*UG* p436, *AUG* p170).

Having converted one or two of my own programs to work with the 2P, I turned my attention to the commercial sideways ROMs which I had access to. Sadly many of these would not work. (The Acornsoft ones like *View* and BCPL did!). Often the problem appeared to be trivial. Directly poking a help or menu page to the screen, for example. However, many of the monitor-type ROMs which incorporate a facility to dump or disassemble other sideways ROMs would not perform this task correctly. The reason is not hard to see. Sideways ROMs are selected by writing their slot number to location &FE30 in the I/O memory map, which contains a write-only switch. A record of the state of this switch is maintained in location &F4. The monitor ROM copies a routine into RAM which then switches these locations to the ROM you desire to inspect, and then accesses it usually using indirect-indexed addressing, before switching back to the monitor ROM. However, when such a sideways language ROM is selected with a 2P installed, it is copied across to the 2P automatically, and then executed in the 2P memory space. Thus the switch at &FE30 and the copy at &F4 are not available, as they are in the wrong memory map!

Thus to use this facility from the 2P, it is necessary to access &FE30 and &F4 in the I/O memory map, and to read the required ROM data, again in the I/O map, before sending the resulting information back to the 2P. This requires a certain amount of machine code to be resident in the I/O memory map to carry out the task. There are two problems. First how do you get the code there, and second, how do you execute it? There are two solutions to the first problem. The code can be loaded directly from tape/disc/net into the I/O processor rather than the 2P by using an eight-digit load address with the first four digits set to &FF. Thus if the code should reside at &1500 in the I/O map, then type *LOAD progname FFFF1500. (To load it into the 2P set the first four digits to 0 – *LOAD progname 1500 or *LOAD progname 00001500). The second method is to prepare the code in the 2P and then use OSWORD 6 to copy it across byte by byte.

The second problem, how to execute the code in the I/O processor, is solved as follows. The beginning of page &200 in both processors memory maps hold a series of vectors through which various operating system calls are indirected. The particular one of interest is the USERV vector located at &200 in the I/O memory. This is used by the commands *CODE and *LINE, which have been discussed before in *Acorn User* (November 1983 pp 51-53). Alternatively, OSBYTE 136 can be used to access this vector. The vector contents in the I/O memory map are altered (using OSWORD 6) to point to the code which has been poked across into the I/O memory. The code can then be executed by calling OSBYTE 136 in the 2P.

The example program (yellow page vii) uses this technique to allow you dump the first 'page' of a sideways ROM onto the screen.

PROCwrite(data,addr) writes the byte 'data' to the I/O memory address 'addr'. FNread(addr) reads the contents of the byte at 'addr' in the I/O memory. PROCstarcode performs a *CODE command, using OSBYTE 136. This calls the machine code routine which has been placed in the I/O memory by PROCover. The code consists of the following instructions:

```
JSR &FFB9
STA &F6
RTS
```

The routine &FFB9 (OSRDRM) is contained in the 1.2 OS ROM. It is documented in the *AUG* on page 106. On entry the Y register contains the ROM number to be accessed, and the routine returns with the byte whose address is contained in &F6 and &F7 in the accumulator. For those who dislike using this unofficial OS routine, it essentially contains the following code given in figure 1 (yellow page vii). If desired, this can be substituted into the data statement at line 510, provided the count in line 460 is changed accordingly. Thus lines 460 and 510 would be changed, as in figure 2 (yellow page vii).

Finally, for those who do not have a 2P, program (yellow listing page vii) will run on a stand-alone BBC machine without modification, provided it has OS 1.2. The code which is accessed by the USERV is located at &2200 onwards, which is clear of the top location used by the program, even if PAGE is &1B00 (for a disc + Econet machine). It is also clear of the highest location used by the 2P. This uses an extra &600 above the default page value, as the character font is automatically fully exploded, (equivalent to a *FX20,6 command) allowing any ASCII character to be redefined. (Note: If you have a sideways ROM board fitted, you can change the range of R% in lines 50 and 60 to 0–15.)

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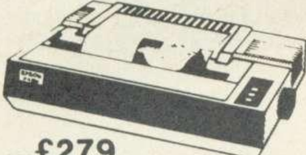
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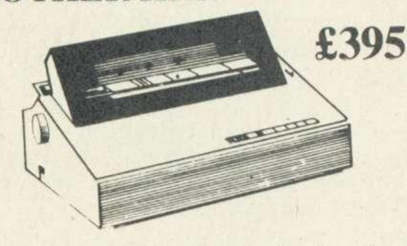
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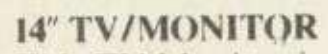
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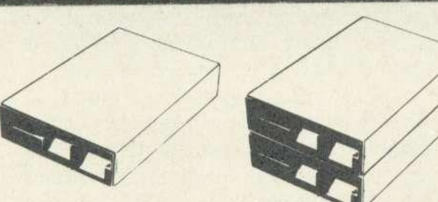
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NEW CHIP WITH TUBE

DNFS chip reviewed by Robin Newman

What follows will, initially, only be of interest to those who have acquired a DNFS ROM as part of the 6502 second processor package. However, as this chip is being 'rommed' it seems likely that it will supersede the DFS 0.9 and NFS 3.34 chips which have to date been supplied with disc and Econet interfaces, and thus become of wider interest.

The DNFS chip supplied with 6502 second processors can in two senses be described as three in one. First, it contains three separate sections of code. A disk filing system, a network filing system, and code to set up the Tube interface to the second processor. This latter section of code (some &400 bytes long) is automatically copied down to pages &400 to &700 of the input/output processor (the original BBC computer) if the Tube hardware is detected on power-up (or CTRL-BREAK). The first 8k of the 16k DNFS ROM also contains the Net filing system, while the disk filing system software largely resides in the second 8k of the ROM.

Because two filing systems are in the same ROM, provision has to be made to disable each one separately, as the combined ROM may be used in machines which have only one (or even neither) of the two associated hardware interfaces fitted. A software switch has been incorporated in the ROM to do this.

During the power-up sequence the ROM receives two service calls to allocate the memory required by the filing systems it supports. It is these which cause (among other things) the default value of page to be adjusted to &1200 (NFS only supported), &1900 (DFS only), or &1B00 – both NFS and DFS supported. (This assumes the second processor is not connected, although such memory allocations still take place in the I/O memory map if it is, although they remain hidden from the user in that case.)

The service entry at &8003 points to &80F7. Inspection of the code from that address onwards finds the service call (code 1) for allocating memory to the NFS at &8105. Initially this tests for the presence of the 68B54 Advanced Data Link Controller chip which is the heart of the Network hardware interface. If the test fails, the most significant bit of the byte allocated to the ROM in the workspace table from &DFO to &DFF is set. This is tested on subsequent calls to the NFS and if set it causes all such calls to be ignored: ie the NFS does not appear to be present in the ROM. Thus if the user sets this bit directly, the NFS can be effectively switched off, and will remain so until the machine is switched off again (or the bit is directly reset).

A similar test is made at the start of the code servicing the DFS (from &B494 onwards). In this case the status register of the 8271 (at &FE80) is read. According to the 8271 data sheet, this will always return 0 in bits 0 and 1. However, if the 8271 is not fitted the data lines will be pulled high and these bits will both be a 1. In this case the code ignores calls to the DFS. However, it appears that a software switch is also provided to cause DFS calls to be ignored. Code at &B49C tests bit 6 of the same byte that contains the NFS ignore flag. If bit 6 is set, the DFS call is ignored. I have not yet found where this is used in the ROM, but the user can take advantage of this facility directly to disable the DFS if required.

So much for the background, but of what use is this all, and how in practice is the disabling/re-enabling carried out? The advantage of the disabling is that it is possible with a simple software 'poke' to change the configuration of your machine so that it behaves as: a machine fitted with only a DFS; a machine fitted with only an NFS; or as a machine fitted with no additional filing system, ie a standard tape machine, (with sideways ROM support). In each case, the default value of page (the system OSHWM) will take up the value it would have for the particular system concerned, thus releasing valuable memory space for the user. The only way to do this with the old discrete DFS and NFS is to physically remove some chips, as it is no good using the dodge of putting a 0 in the relevant position in the ROM type table at &2A1–&2B0, as this will be reset when the break key is pressed, and so you could not push break to reset page and the default filing system. Thus the second claim for this DNFS ROM as being three in one becomes apparent. With its help and a simple software command, your machine can be quickly turned from a simple tape machine to a disc-only or network-only machine, or to a full-blown disc plus net machine (assuming the machine has the relevant hardware interfaces). One example is when using a 'tape'-based program from disc. After loading, the DFS is disabled, and the program relocated to &E00. It can now be RUN in the correct environment, and (unless it is protected) will survive break.

Now for the 'how'. First, a word of warning, particularly to games addicts. The process can happen inadvertently if you use a program which uses page &D00. The disabling flag is contained in a byte between &DF0 and &DFF (dependant upon the positon of the DNFS ROM sideways 'slot'). If the game or other software corrupts this byte, you may find when you push break or CTRL-BREAK at the end of the game, that your DFS or NFS has totally disappeared, and that you can only get it back by switching the machine off and on again! (In fact it is possible to retrieve the situation with a memory 'poke'.) The first thing to ascertain is the position of the DNFS ROM in the available sideways ROM slots. Mine is situated next to the Basic ROM in the slot second from the right-hand edge of the circuit board. This is slot 13 or &E, and in this case the relevant byte in the workspace table is &DF0 + &E which gives &DFE. This location will be used in the following description, but change it to your DNFS slot.

To disable NFS. This requires the msb of &DFE to be set. The 'nicest' way to do this is to type:

?DFE = ?DFE OR &80 <return>

Alternatively, look at the contents of &DFE (using P. ~&DFE <return>), which in my case gives &17, although this may differ depending upon your machine configuration, and then add &80 to this value, giving &97, before

page 70 ▶

I WOULD like to acknowledge the help I have received from three sources. First Acorn (yes they *do* answer the telephone and *are* helpful with technical enquiries), second, Chris Dawkins of Felsted School, and third, but by no means least, the *Advanced User Guide*, pp 246 (*FX255 details), 273 (paged ROM type table), 281 (paged ROM workspace table), and 320–321 (service calls types 1 and 2).
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As the routine (listing 3) was written for a disc system, it is located at &A00 although you may wish to move it to suit your own purposes. This can be achieved simply by changing the contents of the vector contained in lines 190 and 200. When activated by pressing the escape key, the routine investigates the contents of location &70. If it contains 0, a VDU 2 is issued (line 80) and a 1 stored at &70. When this location contains 1, a VDU 3 is sent (line 110). The two linefeeds that are sent after turning the printer off (lines 130 and 140) are there to tidy up the output, as it is unlikely that printing will be halted exactly at the end of a line.

Line 50 performs a *FX126,0 to acknowledge the pressing of escape, line 210 sets the initial contents of &70 so that the first interrupt will turn the printer from off to on and line 220 enables the 'escape pressed' event. While the routine is in action the escape key will only perform the action of switching the printer on and off. To return the key to normal usage, turn off the interrupt by typing *FX13,6.



How big is my file?

OFTEN it is useful, says Mr Davies from Horley, to determine a file's size (or whether it exists or not!). This is normally quite difficult to achieve within a Basic program, but the function in listing 4 (page ii) will return the filesize including zero if the file does not exist. This function may be used as follows:

My__File__Size% = FNsize("My__File")

Now the question is, can anyone adapt this to intelligently read the disc's catalogue and return the length of each file on it? £10 awaits the best solution!

Reading Wordwise into Basic programs

THREE more useful utilities have come in from Mr Davies. The first is on reading *Wordwise* files into Basic programs. Now, BBC Basic stores string information in the form:

'00':string–length:sdrawkcab gnirts: (ie:string backwards:)

Wordwise and other wordprocessing programs store strings as:

:string characters &0D:

In other words, a sequence of characters followed by carriage return. To read this into a Basic file requires the following simple function definition given as listing 5. The file to be read should be opened using fi% = OPENIN ("filename"). Strings may be read simply by the use of this function as in the simple program given in listing 6.

An obvious extension to the above function is a procedure that writes files that can be read by *Wordwise*. Such a procedure is given as listing 7. The file to be written to should be opened using fi% = OPENOUT("filename").

Listing 5.

```
1000 DEF FNread(fi%)
1010 LOCAL a$: a$ = ""
1020 REPEAT
1030   a$ = a$ + CHR$(BGET£fi%)
1040   UNTIL (RIGHT$(a$) = CHR$&OD) OR (EOF £fi%)
1050 = a$
```

Listing 6.

```
100 fi% = OPENIN("filename")
110 REPEAT
120   data$ = FNread(fi%)
130   PRINT data$;
140   UNTIL EOF £fi%
```

Listing 7.

```
2000 DEF PROCwrite(fi%,a$)
2010 LOCAL i%, c%
2020 FOR i% = 1 TO LEN(a$)
2030   c% = ASC(MID$(a$,i%,1))
2040   BPUT £fi%,c%
2050   NEXT
2060 IF RIGHT$(a$,1) <> CHR$13 THEN BPUT £fi%,13
2070 ENDPROC
```

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poking it back with ?&DFE = &97 <return>. To complete the change, push BREAK to reset page and to select the new default filing system.

To disable DFS. This requires bit 6 of &DFE to be set. Type:

?DFE = ?DFE OR &40 <return>

Alternatively, as above, you could add &40 to the contents of &DFE and type ?&DFE = &57 <return>. Push break as above.

To disable both NFS and DFS. Now both bits 6 and 7 must be set. Type:

?DFE = ?DFE OR &CO <return>

Alternatively, using the value obtained in &DFE + &CO type ?&DFE = &D7 <return>. Push break as above.

To restore the original setup, you merely have to restore the original value to &DFE. The 'nice' way is:

?&DFE = ?&DFE AND &3F <return>.

Alternatively, using the example value from above, enter ?&DFE = &17. Finally push break to reselect the default filing system, and reset page.

Finally, two notes to augment the details provided in the second processor handbook, concerning the DNFS ROM. First, it states on page 47 (correctly) that the DFS has priority over the NFS – ie the computer will power up in DFS rather than NFS if left to its own devices. However, what is not mentioned is that you can use the left-hand one of the eight links on the front right of the keyboard to alter this. If this link is made, the priority is reversed. This can also be done to a lesser degree with an FX call, namely *FX 255,0,127 which will reverse the priority following the next break, and will remain in force until the next CTRL-BREAK. Alternatively *FX 255,128,127 will turn it back.

Second, on page 49, a list is given of the changes made to the Econet filing system. One omission, which we discovered the hard way at Oundle, is that the protocol for the broadcast facility, which allows eight-data bytes to be sent to *any* machine on the network, is implemented in a different manner. In version 3.34 (the first release version) the eight bytes received are transferred to the receive control block in the eight spaces normally used by pointers to the start and end of the receive buffer. In the DNFS (net version 3.60) this has been changed to the 'normal' receive procedure. Thus the eight bytes are transferred to a receive buffer pointed to by entries in the receive control block as described on page 77 of the Econet system guide. This is a fairly esoteric change, but it has forced us to accommodate, both protocols!

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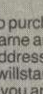
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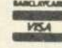
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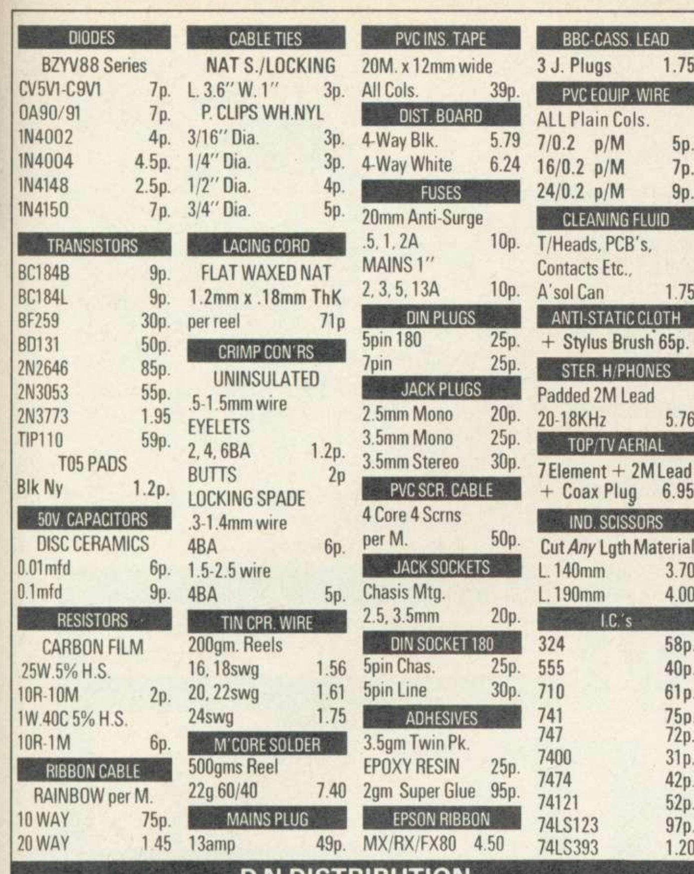
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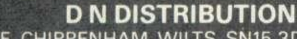


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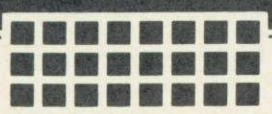
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Paul Beverley explains how the Beeb's random number generator works, and suggests a DIY system for greater randomness and speed

RANDOM THOUGHTS

THE random number generator is our subject this month: how it works, whether it can be improved, and how to use it in machine code programs. Although random numbers are produced by software, the algorithm used, a 33-bit binary sequence generator, is based on an electronic circuit referred to as a 'ring-counter' or 'chain-code generator'. Before we look at the software, let's see how the circuit works. Figure 1 shows a simple four-bit ring counter which consists of a shift register made up of four bistables which are basically one bit memory cells. Every time the register receives a clock pulse, each bit shifts one place to the right and the first bit (Q0) takes on the value of the data input. This input is produced by feeding back the outputs of two stages of the register through an exclusive -OR (EOR) gate.

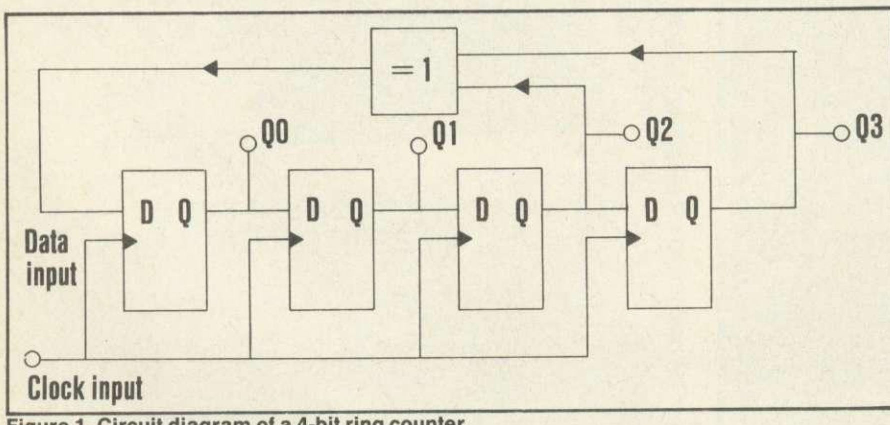


Figure 1. Circuit diagram of a 4-bit ring counter

```
AF87-   A0 20    LDY #&20   \ Count 32 shifts.
AF89-   A5 0F    LDA &0F    \ Move bit 3
AF8B-   4A       LSR A      \ of &0F into
AF8C-   4A       LSR A      \ LSB of the
AF8D-   4A       LSR A      \ accumulator.
AF8E-   45 11    EOR &11    \ EOR it with bit 33
AF90-   6A       ROR A      \ Put LSB into Carry flag.
AF91-   26 0D    ROL &0D    \ Shift along
AF93-   26 0E    ROL &0E    \ all four
AF95-   26 0F    ROL &0F    \ bytes, and
AF97-   26 10    ROL &10    \ finally the carry
AF99-   26 11    ROL &11    \ into LSB of &11.
AF9B-   88       DEY        \ Count down to zero.
AF9C-   D0 EB    BNE &AF89  \ Do it again.
AF9E-   60       RTS
```

Figure 2. Section of machine code from the Basic II ROM – shifts the pseudo-random number generator 32 places. The same routine in Basic I starts at &AFB6

This circuit consists of four bits, so there are 2^4 (ie, 16) possible combinations of outputs; but if the register is set to zero initially, the value will always stay at zero. This is because 0 EOR 0=0, which means the data input to the register is always zero. However, if you start with any other number, this ring counter will go in a particular sequence through all the remaining 15 possible combinations. The sequence produced depends on which of the lines are fed back, and only certain combinations of lines will give the maximum length sequence. In the case of a four-bit counter we have to use either Q3 and Q2, or Q3 and Q0. Using Q3 with Q1 will cause this counter to go into a loop consisting of fewer than the maximum 15 states.

With a longer shift register, certain lengths of register have no combination of two feedback lines that will produce the maximum possible cycle length of (2^N – 1) states. In those cases, three feedback lines will still not produce the full cycle length, and four lines have to be used. Table 1 shows the numbers of lines needed for various lengths of register.

A very long ring-counter can be used as a means of generating a pseudo-random number. We call it 'pseudo-random' since it is not based on a truly random phenomenon, but provided you use a long enough cycle length it is adequate for most purposes. The generator used on the BBC micro consists of a 33-bit ring counter, which gives a cycle length of 2^33 – 1 which works out at 8,589,934,591! Before I discovered

what the algorithm was, I wrote the fastest Basic program I could to see if I could find out when the sequence of numbers produced by the RND command repeated itself. I gave up after three days – a good job, for to find the repeat would have taken almost six months' continuous processing!

The reason for using 33 bits is that we need to produce four-byte random numbers but, as shown in table 1, the number of feedback lines needed for maximum cycle length on a 32-bit counter is four. Thus it is easier to use one bit of a fifth byte to make it up to 33 bits, and then you have only to exclusive-OR two lines.

Number of stages	Number of feedback lines
3	2
4	2
5	2
6	2
7	2
8	4
9	2
10	2
11	2
12	4
13	4
14	4
15	2
16	4
17	2
23	2
24	4
25	2
31	2
32	4
33	2

Table 1. The number of feedback lines needed to produce a maximum length cycle on an N bit ring counter

Figure 2 shows a disassembled listing of the code, and figure 3 shows it schematically. The comments on the listing and the diagram should explain what is going on. The idea is that it does 32 shifts each time a new random number is wanted. Then if you have asked for RND(1), Basic has to do further manipulation to make it into a floating point number between 0 and 1.

Set up before call	Code being timed	Time (μs)	Number range	Comments
–	R% = RND	1160	−2^31/+2^31	
G% = &AF87:D% = &0D	CALL G%:R% = !D%	1700	−2^31/+2^31	Slower!
I% = 256	R% = RND(I%)	3680	1 – 256	
G% = &AF89: Y% = 8:D% = &0D	CALL G%:R% = ?D%	1130	0 – 255	8 bit shift
G% = &AF87:D% = &0D	CALL G%:R% = ?D%	1680	0 – 255	32 bit shift
I% = 8	R% = RND(I%)	3650	1 – 8	
I% = 7	R% = RND AND I%	1460	0 – 7	I% could be 3, 15, 31, 63 etc
–	R = RND(1)	1560	0 – 1	
H% = &7FFFFFFF				
G% = &AF87:D% = &0D	CALL G%:R = !D%/H%	3830	0 – 1	Slower!

Table 2. Timings of various random number generator calls (calls for BASIC I are &AFB6 and &AFB8)

For RND(N%), where N% > 1, it takes a number between 0 and 1, multiplies it by N% and rounds it up to the nearest whole number to give a number between 1 and N%.

As you can see from table 2, it takes between just over a millisecond (ms) and about 3.6ms to produce these numbers. This may not seem a long time, but for some simulations or machine code games it would be good to have some means of speeding things up. There are three possible approaches; the first is to try to speed up the use of the generator in the Basic ROM, the second is to write a faster simulation, and the third, for the fastest speed, is to make up the generator in the form of an electronic circuit, and read it using some sort of interface.

Even when working in Basic it is possible to speed things up in certain cases, as shown in table 2. If you need a four-byte number as produced by RND then it is no quicker to CALL the routine, but if you want only a single-byte random number it is an advantage to CALL the routine. The results show that RND (256) is much slower than CALLing the routine and picking off the byte using byte indirection, even if you shift it by 32 bits instead of eight.

The other way to improve the speed is to use a number range which is a power of two. This is done by using RND and doing a logical AND on it with 3, 7, 15, 31, 63, etc. This effectively picks off a number of bits from the bottom of the four-byte number. You have to remember, though, that RND AND 7, for example, produces a number between 0 and 7, and the nearest equivalent is RND(8), which produces a number between 1 and 8.

When writing machine code programs, it is possible to use the random number generator in the Basic ROM, provided of course you don't want to put your code in sideways ROM. Even so, it is simplicity itself to copy the code shown in figure 2 into your own program.

For example, all you have to do if you want an eight-bit random number is to shift the generator eight times and read off one of the bytes.

Thus:

```
LDY #8
JSR &AFB8 (or &AF89 for Basic II)
LDA &OD
```

would return the random number in the accumulator.

When it comes to writing a new random number routine, the problem is that reducing the length of the counter

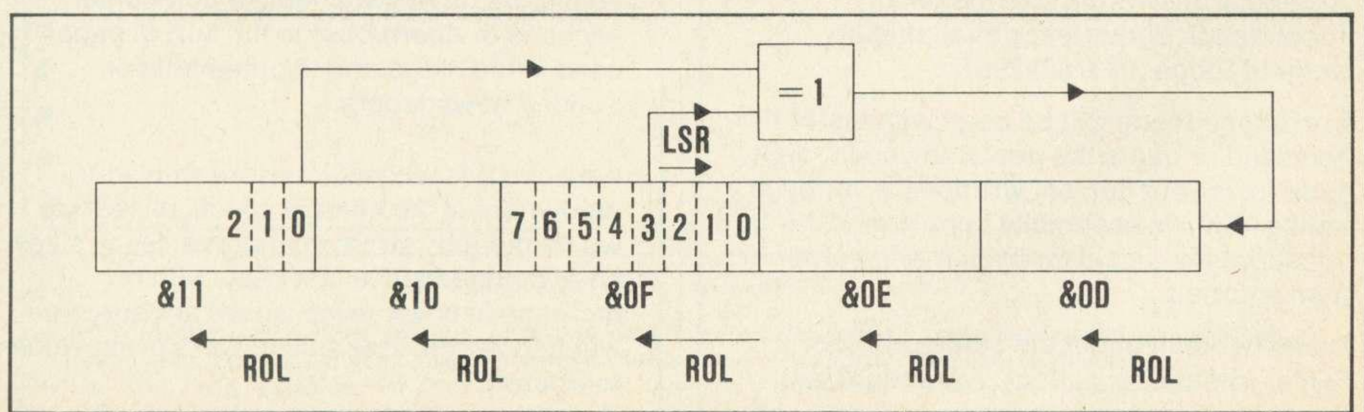


Figure 3. The 33-bit ring counter simulated by program 1

shortens the cycle time and therefore reduces the randomness. The technique I have used is to shorten the length to two bytes and use only 15 of the 16 bits for feedback purposes to simplify the exclusive-OR process (table 1). To regain some of the lost randomness I have used an interrupt routine which increments a counter. While shifting the two bytes, this counter is exclusive-ORed with the other feedback lines.

All this is illustrated in program 1 (yellow page ix). This includes two methods of testing the randomness of the generator and also allows you to apply the tests to the existing generator for comparison. The first test is a bitmap which puts dots on the screen whose co-ordinates are selected by the generator. This will soon reveal any patterns in the cycling. The second is a frequency graph or histogram which plots a graph of the number of times (Y-axis) each of the numbers 0 to 255 (X-axis) are selected.

I am not convinced as to how effective these routines are at testing the randomness of the generators, but I have tried in vain to find a better way. The impressive looking equations in learned papers about random number generators were totally incomprehensible to me. Is there a statistician out there who knows how to test random number generators?

Nevertheless, the results of these tests seem to show that the new generator gives roughly the same degree of randomness as the original one, even though it takes only 14.5 microseconds (µs) per shift (116 µs per eight-bit number) compared with the 22 µs per shift (176 µs per eight-bit number) that the Basic generator takes. The new generator, however, needs an interrupt routine as well which will slow down the overall speed of the program slightly. However, the routine adds only 4µs to each interrupt routine, and interrupts occur only every 5ms, so that is less than 0.1% reduction in speed.

The parts of the program relating to producing the new random number are line 720, which picks up the present value of the interrupt vector, lines 850 and 860, which make up the interrupt routine, lines 900–960, which change the interrupt vector, lines 1000–1060, which restore the original interrupt vector to disable our additional routine, and lines 1160–1250, which contain the shifting algorithm itself.

Now for a challenge. If you want to write your own random number routine, you can put it in place of the 'newRND' routine and test it out. If it either shows better randomness on each of the two tests than either of the routines given, or it's faster than 14.5µs per shift, let us know, and we'll publish it. However, if you really want a good-quality, high speed random number generator you'll have to wait for next month.

Next month A random number generator made from components costing less than £4 which attaches to the user port. It can produce eight-bit numbers at a maximum rate of one every 20µs, and reading the number takes only 6µs, which gives you 14µs to do something with it before the next one is ready.

16 PAGES OF FUN AND LEARNING

THE 16 yellow pages in this section contain all the major programs in this issue. We've separated the listings from the articles to make them easier for you to type in and find – or even cut out and keep separately under topics such as graphics, sound, utilities, etc.

See 'Sounds inviting', page 47

```
   10 REM *** ON THE LAKE ***
   20 REM **(c) Acorn User **
   30 MODE 6
   40 VDU19,0,4;0;
   50 PRINT'''''''
   60 PRINT SPC(10)" ON THE LAKE"
   70 PRINT''''SPC(9)"(c) Acorn User"
   80 O=0
   90 D=0
  100 D=D+1
  110 RESTORE 220
  120 FOR N=1 TO 44
  130 READ A, B, C
  140 SOUND 1,-15,A+O,C
  141 SOUND 2,-15,B+O,C
  150 NEXT N
  160 ON D GOTO170,180,190,210,210
  170 O=-24 : GOTO100
  180 O=0   : GOTO100
  190 O=-12 : GOTO100
  200 O=-24 : GOTO100
  210 END
  220 DATA165,101,5,157,101,5,149,101,5,
177,97,5,177,89,5,177,81,5,165,101,5,157
,101,5,149,101,5,177,97,5,177,89,5,177,8
1,5,165,101,5,157,101,5,149,101,5
  230 DATA169,109,5,165,109,5,169,101,5,
177,97,5,169,97,5,165,101,5,157,81,5,157
,89,5,97,97,5,165,101,5,157,101,5,149,10
1,5,177,97,5,177,89,5,177,81,5
  240 DATA165,101,5,157,101,5,149,101,5,
177,97,5,177,89,5,177,81,5,165,101,5,169
,101,5,165,101,5,157,89,5,165,89,5,157,8
9,5
  250 DATA149,101,15,149,101,10
```

Listing 1

```
   10 REM ****   RIDING     ****
   20 REM ** (C)  Acorn User **
   30 MODE 6
   40 VDU19,0,4;0;
   50 PRINT'''''''
   60 PRINT SPC(7)"A TUNE CALLED RIDING"
   70 PRINT''''SPC(9)"(c) Acorn User"
   80 O=24
   90 FOR NNN=1 TO 2
  100 FOR NN=1 TO 2
  110 RESTORE 210
  120 FOR N=1 TO 42
  130 READ A, B, C
  140 SOUND1,-15,A-O,C*8
  150 SOUND2,-15,B-O,C*8
  160 NEXT N
  170 O=O-12
  180 NEXT NN
  190 O=24
  200 NEXT NNN
  210 DATA165,101,1,169,101,1,165,101,1,
177,117,1,169,117,1,165,117,1,157,129,1,
165,129,1,157,129,1,169,129,1,165,129,1,
157,129,1,149,117,1,157,117,1,149,117,1
  220 DATA165,101,1,157,101,1,149,101,1,
157,129,3,157,121,3,165,117,1,169,117,1,
165,117,1,177,101,1,169,101,1,165,101,1,
157,121,1,165,121,1,157,121,1
  230 DATA169,109,1,165,109,1,157,109,1,
165,129,1,169,129,1,165,129,1,157,121,1,
165,121,1,157,121,1,149,117,1,149,129,1,
149,117,1,149,101,3
```

Listing 2

SPECIAL MONTHLY LISTINGS CASSETTE

FOR readers who have trouble typing in listings, or just don't have the time and patience, *ACORN USER* has made a special cassette available containing all the major programs in this issue. It costs just £3.75, which includes postage and packing. Turn to page 81, which is immediately after this yellow pages section, for details.
The order form is at the bottom of page 82.

See pages 65 and 70

Listing 3. Printer toggler interrupt routine by C Binstead

```
  1 REM                       PTRTGLR - PRINTER TOGGLER INTERRUPT ROUTINE
  2 REM                       -----------------------------------------
  3
 10 FOR I%=0 TO 2 STEP 2
 20    P%=&A00
 30    [OPT I%
 40    PHP : PHA : TXA : PHA : TYA : PHA        /Save Registers
 50    LDA #126 : LDX #0 : JSR &FFF4            /Acknowledge ESCAPE pressed
 60    LDA&70 : CMP#0                           /Check 'Toggle' byte
 70    BNE PTROFF                               /If 1 turn printer off
 80    .PTRON : LDA#2 : JSR &FFEE               /VDU 2 - Turn printer on
 90    LDA#1 : STA&70                           /Invert 'Toggle' byte
100    JMP PIF                                  /Interrupt finished
110    .PTROFF : LDA#3 : JSR &FFEE              /VDU 3 - Turn printer off
120    LDA#0 : STA&70                           /Invert 'Toggle' byte
130    LDA#1 : JSR &FFEE : LDA#13 : JSR &FFEE   /VDU 1,13 - Send CR to printer
140    LDA#1 : JSR &FFEE : LDA#13 : JSR &FFEE   /VDU 1,13 - Send CR to printer
150    .PIF
160    PLA : TAY : PLA : TAX : PLA : PLP        /Restore registers
170    RTS:]      REM                           Return from interrupt routine
180    NEXT I%
190 ?&220=&0 : REM                              Low  byte of interrupt address
200 ?&221=&A : REM                              High byte of interrupt address
210 ?&70=0   : REM                              Start condition 'Printer off-on'
220 *FX14,6  : REM                              Enable 'ESCAPE PRESSED' event
```

Listing 4. Function to return the filesize, by Mr Davies of Horley

```
3000 DEF FNsize(filename$)
3010 REM
3020 REM **  Define osfile.
3030 LOCAL osfile: osfile= &FFDD
3040 REM
3050 REM **  Set up osfile workspace in zero page.
3060 LOCAL m%: m%= &70: m%!&A= 0
3070 REM
3080 REM **  Store filename$ in a temporary memory area.
3090 LOCAL n%: n%= &100: $n%= filename$
3100 REM
3110 REM **  Point osfile workspace to filename$
3120 m%?0=n% MOD &100: m%?1=n% DIV &100
3130 REM
3140 REM **  Now set X% and Y% to point to workspace
3150 REM **  and set A% to 5. This requests the files
3160 REM **  attributes from the disc catalogue.
3170 X%=m%: Y%=m% DIV &100: A%=5: CALL osfile
3180 REM
3190 REM **  Finally, extract the size from the workspace.
3180 =m%!&A
```

See 'How to correct listings', page 37

```
10 REM listing 1
20 REM Uncorrected version
30 MODE 1
40 PROCinitialise
50 PROCclock
60 ON ERROR GOTO 80
70 PROCrun
80 REPEAT
90 PROCINPUT
100 UNTIL0
110 END
120 :
130 DEFPOCinitialise
140 *FX111,0
150 @=0
160 DIM B(1),hex$(15),oldB1)
170 VDU 23;8202;0;0;0
180 VDU 19,0,4,0,0
190 VDU 19,2,0,0,0
200 VDU 24,0,352;1279;1023;
210 FOR N=0 TO 15
220 hex$(n)=CHR$
    (N-48*(N<10)-55*(N>9))
230 NEXT N
240 GCOL0,129
250 CLG
260 VDU,28,0,31,39,21
270 END
280 :
290 DEFPROCclocks
300 VDU5
310 GCOL0,2
320 MOVE320,110
330 PRINT"Hexadecimal numbers
340 rad=250
350 FOR N-0 TO 1
360 FOR T=0 TO 51
370 VDU29,(300+600*N);700;
380 MOVE(rad*SIN(T*PI/8)),
    (rad*COS(T*P1/8))
390 PRINT hex$(T)
400 NEXT N
410 NEXT T
420 GCOL0,3
430 rad=280
440 FOR N = 0 TO 1
450 VDU29,(312+600*N;685;
460 MOVE0,rad
470 FOR T=O TO 2*PI STEP PI/12
480 DRAW(rad*SIN(T)),(rad*C0S(T))
490 NEXT T
500 NEXT N
510 VDU4
520 ENDPROC
530 ;
540 PROCrun
550 FOR T=1 TO 255
560 PROCdisplay(t)
570 NEXT T
580 ENDPROC
590 :
600 DEFPROCdisplay(number)
610 oldb(0)=B(0)
620 oldB(1)=B(1)
630 B(0)=number MOD 16
640 B(1)=number D1V 16
650 FOR N=0 TO 1
660 PROCincrement(7,oldB(N)
670 PROCincrement(5 B(N))
680 NEXT N
690 PROCprint
700 X-GET
710 ENDPROC
720 :
730 DEFPROCpint
740 CLS
750 COLOUR 2
760 PRINTTAB(1,2)"&";hex(B(1));"0";
770 COLOUR 3
780 PRINT = 16 x "B(1)" = ";
790 C0LOUR 1
800 PRIN T(1)*16
810 COLOUR 2
820 PRINTTAB(25,2)"&";hex$(B(0));
830 COLOUR 3
840 PRINT" = "
850 COLOUR 1
860 PRINT B(0)
870 COLOUR 2
880 PRINTTAB(9,9)"&";
    hex$(B(1)),hex$(B(0));
890 COLOUR
900 PRINT" = ";
910 COLOUR1
920 PRINTnumber
930 COLOUR 2
940 PRINT" in BASE 10"
950 PRINTTAB(12,9)"Press spice bar"
960 ENDPROC
970 :
980 DEFPROCincrement(Z,value)
990 VDU29,(918-600*N);685
1000 rad=200
1010 ang=value*PI/8
1020 MOVE0,0
1030 PLOT Z,rad*SIN(angle),rad:COS(angle)
1040 ENDPROC
1050 :
1060 DEFPROCinput
1070 repeat
1080 CLG
1090 INPUTTAB(5,5)"Enter a number
     in base 10 "number
1100 UNTIL (number% > =1)
     AND (number% < 256)
1110 PROCdisplay(number%)
1120 ENDPROC
```

See 'How to correct listings', page 37


```
  10 REM listing 2
  20 REM Correct version
  30 MODE 1
  40 PROCinitialise
  50 PROCclocks
  60 ON ERROR GOTO 80
  70 PROCrun
  80 REPEAT
  90 PROCinput
 100 UNTIL0
 110 END
 120 :
 130 DEFPROCinitialise
 140 *FX11,0
 150 @%=0
 160 DIM B(1),hex$(15),oldB(1)
 170 VDU 23;8202;0;0;0;
 180 VDU 19,0,4,0,0,0
 190 VDU 19,2,0,0,0,0
 200 VDU 24,0;352;1279;1023;
 210 FOR N=0 TO 15
 220 hex$(N)=CHR$
     (N-48*(N<10)-55*(N>9))
 230 NEXT N
 240 GCOL0,129
 250 CLG
 260 VDU 28,0,31,39,21
 270 ENDPROC
 280 :
 290 DEFPROCclocks
 300 VDU5
 310 GCOL0,2
 320 MOVE320,1010
 330 PRINT"Hexadecimal numbers"
 340 rad=250
 350 FOR N=0 TO 1
 360 FOR T=0 TO 15
 370 VDU29,(300+600*N);700;
 380 MOVE(rad*SIN(T*PI/8)),
     (rad*COS(T*PI/8))
 390 PRINT hex$(T)
 400 NEXT T
 410 NEXT N
 420 GCOL0,3
 430 rad=280
 440 FOR N = 0 TO 1
 450 VDU29,(312+600*N);685;
 460 MOVE0,rad
 470 FOR T=0 TO 2*PI STEP PI/12
 480 DRAW(rad*SIN(T)),(rad*COS(T))
 490 NEXT T
 500 NEXT N
 510 VDU4
 520 ENDPROC
 530 :
 540 DEFPROCrun
 550 FOR T=1 TO 255
 560 PROCdisplay(T)
 570 NEXT T
 580 ENDPROC
 590 :
 600 DEFPROCdisplay(number)
 610 oldB(0)=B(0)
 620 oldB(1)=B(1)
 630 B(0)=number MOD 16
 640 B(1)=number DIV 16
 650 FOR N=0 TO 1
 660 PROCincrement(7,oldB(N))
 670 PROCincrement(5,B(N))
 680 NEXT N
 690 PROCprint
 700 X=GET
 710 ENDPROC
 720 :
 730 DEFPROCprint
 740 CLS
 750 COLOUR 2
 760 PRINTTAB(1,2)"&";hex$(B(1));"0";
 770 COLOUR 3
 780 PRINT" = 16 x "B(1)" = ";
 790 COLOUR 1
 800 PRINTB(1)*16
 810 COLOUR 2
 820 PRINTTAB(25,2)"&";hex$(B(0));
 830 COLOUR 3
 840 PRINT" = ";
 850 COLOUR 1
 860 PRINT B(0)
 870 COLOUR 2
 880 PRINTTAB(9,6)"&";hex$(B(1)),hex$(B(0));
 890 COLOUR 3
 900 PRINT" = ";
 910 COLOUR1
 920 PRINTnumber;
 930 COLOUR3
 940 PRINT" in BASE 10"
 950 PRINTTAB(12,9)"Press space bar"
 960 ENDPROC
 970 :
 980 DEFPROCincrement(Z,value)
 990 VDU29,(918-600*N);685;
1000 rad=200
1010 angle=value*PI/8
1020 MOVE0,0
1030 PLOT Z,rad*SIN(angle),rad*COS(angle)
1040 ENDPROC
1050 :
1060 DEFPROCinput
1070 REPEAT
1080 CLS
1090 INPUTTAB(5,5)"Enter a number in
     base 10 "number%
1100 UNTIL (number% > -1) AND (number% < 256)
1110 PROCdisplay(number%)
1120 ENDPROC
```

See 'How to correct listings', page 37

```
 10 REM listing 3
 20 REM Uncorrected version
 30 MODE 1
 40 PROCinitialise
 50 PROCclock
                  ↑
 60 ON ERROR GOTO 80
 70 PROCrun
 80 REPEAT
 90 PROCINPUT
          ↑↑↑↑↑
100 UNTIL0
110 END
120 :
130 DEFPOCinitialise
        ↑↑
140 *FX111,0
          ↑
150 @=0
    ↑↑
160 DIM B(1),hex$(15),oldB1)
                        ↑↑
170 VDU 23;8202;0;0;0
                   ↑
180 VDU 19,0,4,0,0
                 ↑↑
190 VDU 19,2,0,0,0
                 ↑↑
200 VDU 24,0,352;1279;1023;
             ↑
210 FOR N=0 TO 15
220 hex$(n)=CHR$(N-48*(N<10)-55*(N>9))
          ↑
230 NEXT N
240 GCOL0,129
250 CLG
260 VDU,28,0,31,39,21
     ↑
270 END
     ↑↑↑↑
280 :
290 DEFPROCclocks
300 VDU5
310 GCOL0,2
320 MOVE320,110
          ↑↑
330 PRINT"Hexadecimal numbers
                            ↑
340 rad=250
350 FOR N-0 TO 1
          ↑
360 FOR T=0 TO 51
             ↑↑
370 VDU29,(300+600*N);700;
380 MOVE(rad*SIN(T*PI/8))
    ,(rad*COS(T*P1/8))
                 ^
390 PRINT hex$(T)
400 NEXT N
         ↑
410 NEXT T
         ↑
420 GCOL0,3
430 rad=280
440 FOR N = 0 TO 1
450 VDU29,(312+600*N;685;
                     ↑↑
460 MOVE0,rad
470 FOR T=O TO 2*PI STEP PI/12
         ↑
480 DRAW(rad*SIN(T)),(rad*C0S(T))
                             ↑
490 NEXT T
500 NEXT N
510 VDU4
520 ENDPROC
530 ;
    ↑
540 PROCrun
  ↑↑
550 FOR T=1 TO 255
560 PROCdisplay(t)
               ↑
570 NEXT T
580 ENDPROC
590 :
600 DEFPROCdisplay(number)
610 oldb(0)=B(0)
      ↑
620 oldB(1)=B(1)
630 B(0)=number MOD 16
640 B(1)=number D1V 16
                 ↑
650 FOR N=0 TO 1
             ↑
660 PROCincrement(7,oldB(N)
                       ↑↑
670 PROCincrement(5 B(N))
```

See 'How to correct listings', page 37


```
680 NEXT N
690 PROCprint
700 X-GET
710 ENDPROC
720 :
730 DEFPROCpint
740 CLS
750 COLOUR 2
760 PRINTTAB(1,2)"&";hex(B(1));"0";
770 COLOUR 3
780 PRINT = 16 x "B(1)" = ";
790 C0LOUR 1
800 PRIN T(1)*16
810 COLOUR 2
820 PRINTTAB(25,2)"&";hex$(B(0));
830 COLOUR 3
840 PRINT" = "
850 COLOUR 1
860 PRINT B(0)
870 COLOUR 2
880 PRINTTAB(9,9)"&";hex$(B(1)),hex$(B(0));
890 COLOUR
900 PRINT" = ";
910 COLOUR1
920 PRINTnumber
930 COLOUR 2
940 PRINT" in BASE 10"
950 PRINTTAB(12,9)"Press spice bar"
960 ENDPROC
970 :
980 DEFPROCincrement(Z,value)
990 VDU29,(918-600*N);685
1000 rad=200
1010 ang=value*PI/8
1020 MOVE0,0
1030 PLOT Z,rad*SIN(angle),rad:COS(angle)
1040 ENDPROC
1050 :
1060 DEFPROCinput
1070 repeat
1080 CLG
1090 INPUTTAB(5,5)"Enter a number in base 10 "number
1100 UNTIL (number% > =1) AND (number% < 256)
1110 PROCdisplay(number%)
1120 ENDPROC
```

See 'Beeb Forum', page 65

Figure 1. Routine called from OS ROM

```
A6 F4       LDX   &F4       \ save old rom id
84 F4       STY   &F4       \ insert new rom id
8C 30 FE    STY   &FE30     \ switch to new rom
A0 00       LDY   £&00      \ use indirect indexed addressing
B1 F6       LDA   (&F6),Y   \ to read byte pointed to by &F6,&F7
86 F4       STX   &F4       \ restore old rom id
8E 30 FE    STX   &FE30     \ switch back to old rom
60          RTS             \ return
```

```
460 FOR Z%=0 TO 18
and line 510:-
510 DATA &A6,&F4,&84,&F4,&8C,&30,&FE,&A0,&00,&B1,&F6,&86,&F4,
&8E,&30,&FE,&85,&F6,&60
```

Figure 2. Changes to program 1 if OS routine inserted


```
  0 REM ROM-DUMP (C) R.Newman, Oundle School, May 1984
 10 DIM buf%15,blk%4
 20 osbyte=&FFF4:osword=&FFF1
 30 MODE3
 40 PRINTTAB(30,1)"ROM-DUMP"
 50 INPUTTAB(25,3)"Which ROM? (12-15) "R%
 60 IF R%<12 OR R%>15 THEN PRINTTAB(44,3);SPC(10):GOTO50
 70 PRINT'
 80 AT%=@%:@%=&00020003:REM adjust print field
 90 PROCover: REM "poke" code to IO memory
100 PROCwrite(&80,&F7):REM &F6,&F7 points to page &8000
110 PROCwrite(0,&200):REM point USERV (&200,&201) to code at &2200
120 PROCwrite(&22,&201)
130 FOR Z%=0 TO 255 STEP 16
140 PRINT~(&8000+Z%);" - ";
150 FOR J%=0 TO 15
160 PROCwrite(Z%+J%,&F6):REM set low byte of &F6,&F7 pointer
170 PROCstarcode:REM call USERV code to get ROM byte
180 buf%?J%=FNread(&F6):PRINT~buf%?J%;:
    REM transfer ROM byte & print it
190 NEXTJ%
200 PRINT" : ";
210 FOR J%=0 TO 15:REM print ascii interpretation
220 IF buf%?J%<32 OR buf%?J%>127 THEN PRINT".";
    ELSE PRINTCHR$(buf%?J%);
230 NEXTJ%
240 PRINT
250 NEXTZ%
260 @%=AT%:REM reset print field
270 END
280 DEF PROCwrite(data,addr)
290 LOCAL A%,X%,Y%
300 !blk%=addr:blk%?4=data
310 A%=6:X%=blk%:Y%=X% DIV256
320 CALL osword
330 ENDPROC
340 DEF FNread(addr)
350 LOCAL A%,X%,Y%
360 !blk%=addr
370 A%=5:X%=blk%:Y%=X% DIV256
380 CALL osword
390 =blk%?4
400 DEF PROCstarcode
410 LOCAL A%,X%,Y%
420 A%=136:X%=0:Y%=R%:CALL osbyte
430 ENDPROC
440 DEF PROCover
450 LOCAL Z%
460 FORZ%=0TO5
470 READ data
480 PROCwrite(data,&2200+Z%)
490 NEXT
500 ENDPROC
510 DATA &20,&B9,&FF,&85,&F6,&60 : REM JSR &FFB9: STA &F6: RTS
```

Program 1. Displays the first page sideways ROM on a standard BBC micro

See 'New chip with Tube' on page 68

Code from DNFS ROM to illustrate software disable flags

```
80F7-   2C 8F 02   BIT   &028F     \Service entry
80FA-   08         PHP             \Test keyboard links
80FB-   10 03      BPL   &8100     \Branch if NFS has priority
80FD-   20 9D 9F   JSR   &9F9D     \Disk service calls
8100-   48         PHA
8101-   C9 01      CMP   £&01      \NFS service call 1
8103-   D0 15      BNE   &811A
8105-   AD A0 FE   LDA   &FEA0     \Check 68B54 Status Reg. 1
8108-   29 ED      AND   £&ED
810A-   D0 07      BNE   &8113     \Branch if check fails
810C-   AD A1 FE   LDA   &FEA1     \Check 68B54 Status reg. 2
810F-   29 DB      AND   £&DB
8111-   F0 07      BEQ   &811A     \Branch if check is OK
8113-   3E F0 0D   ROL   &0DF0,X   \Set ignore NFS flag
8116-   38         SEC             \by shifting msb to carry
8117-   7E F0 0D   ROR   &0DF0,X   \setting it and shifting back
811A-   BD F0 0D   LDA   &0DF0,X
811D-   0A         ASL             \Get ignore flag bit
811E-   68         PLA
811F-   30 02      BMI   &8123     \A holds Tube service code so branch
8121-   B0 6E      BCS   &8191     \Branch if ignore flag set
8123-   C9 FE      CMP   £&FE
8125-   90 5C      BCC   &8183
8127-   D0 1B      BNE   &8144     \If not eq. A=&FF (tube init. call)
8129-   C0 00      CPY   £&00
812B-   F0 56      BEQ   &8183
812D-   A2 06      LDX   £&06      \Tube present, so
812F-   A9 14      LDA   £&14      \explode character set (*FX20,6)
8131-   20 F4 FF   JSR   &FFF4
8134-   2C E0 FE   BIT   &FEE0
8137-   10 FB      BPL   &8134
8139-   AD E1 FE   LDA   &FEE1
813C-   F0 43      BEQ   &8181
813E-   20 EE FF   JSR   &FFEE
8141-   4C 34 81   JMP   &8134
8144-   A9 AD      LDA   £&AD      \Set up tube code in I/O processor
8146-   8D 20 02   STA   &0220
8149-   A9 06      LDA   £&06
814B-   8D 21 00   STA   &0221
814E-   A9 16      LDA   £&16
8150-   8D 02 02   STA   &0202
8153-   A9 00      LDA   £&00
8155-   8D 03 02   STA   &0203
....
....
....                           \code continues
....
....
8191-   B0 1C      BCS   &81AF     \Branch again!
....
....
....                           \code continues
....
....
81AF-   28         PLP             \Restore info from keyboard links
81B0-   30 37      BMI   &81E9     \Branch to RTS if Disk had priority
81B2-   4C 9D 9F   JMP   &9F9D     \Jump to disk service calls
....
....
9F9D-   4C 94 B4   JMP   &B494
....
....
....
B494-   48         PHA             \Disk service calls
B495-   AD 80 FE   LDA   &FE80     \Check for presence of 8271 chip
B498-   29 03      AND   £&03      \check bits 0,1 of status reg.
B49A-   D0 4D      BNE   &B4E9     \If not 0 branch and skip disk calls
B49C-   BD F0 0D   LDA   &0DF0,X   \Check DFS ignore flag (bit 6) by
B49F-   0A         ASL             \shifting left and seeing if "new"
B4A0-   30 47      BMI   &B4E9     \bit 7 is set. If so branch.
....
....
....                           \Disk service calls in here
....
....
B4E9-   68         PLA             \Branch to here
B4EA-   60         RTS
```

See 'Random numbers', page 78

Program 1. Demonstrates and tests a new random number generator and compares it with the current version in the Basic ROM

```
 10 PROCinitialise
 20 MODE 0
 30 REPEAT
 40   PROCmenu
 50   UNTIL INKEY(0)>0
 60 END
 70
 80 DEF PROCmenu
 90 REM ********
100 CLS
110 PRINT"Old or new generator? (0 or 1)"
120 INPUT"(-1 to END). Your choice", new
130 IF new = -1 THEN END
140 IF new rndGEN = newRND ELSE rndGEN = basRND
150 PROCassemble_tests
160 IF new CALL int_on
170 INPUT"Histogram or map? (0 or 1)", map
180 IF map PROCdrawmap ELSE PROChist
190 ENDPROC
200
210 DEF PROCdrawmap
220 REM ***********
230 CLS
240 PRINT TAB(65);" ";
250 IF new PRINT"NEW"; ELSE PRINT"BASIC";
260 CALL RNDmap
270 CALL int_off
280 ENDPROC
290
300 DEF PROChist
310 REM ********
320 INPUT"How many sets of values", A%
330 Q% = A%
340 FOR M% = 0TO255
350   N%(M%) = 0
360   NEXT
370 REPEAT
380   CALL RNDhist
390   max% = 0:min% = &FFFF:tot% = 0
400   FOR M% = 0TO255
410     N%(M%) = N%(M%)+?(B%+M%)+?(C%+M%)*256
420     tot% = tot%+N%(M%)
430     IF N%(M%)>max% max% = N%(M%)
440     IF N%(M%)<min% min% = N%(M%)
450     NEXT
460   CLS
470   PRINT"max ";max%;"  min ";min%;
480   PRINT"  ave ";tot%/256;"  ";
490   R% = (max%-min%)/tot%*12800
500   PRINT"  range +/- ";R%;"%  ";
510   IF new PRINT"NEW" ELSE PRINT"BASIC"
520   MOVE 0,N%(0)*4/Q%
530   FOR M% = 1TO255
540     DRAWM%*4,N%(M%)*4/Q%
550     NEXT
560   Q% = Q%+A%
570   UNTIL INKEY(0)>0
580 CALL int_off
590 ENDPROC
600
610 DEF PROCerr_handle
620 REM **************
630 CALL int_off
640 REPORT
650 PRINT" at "ERL
660 ENDPROC
670
680 DEF PROCinitialise
690 REM **************
700 DIM B% 256, C% 256, N%(255)
710 ON ERROR PROCerr_handle:END
720 oldIRQ = !&204 AND &FFFF
730 bas = &AF89
740 REM bas = &AFB8 for BASIC I
750 PROCassemble_generators
760 ENDPROC
770
780 DEF PROCassemble_generators
790 REM ***********************
800 P% = &C00
810 [OPT 2
820
830 .IRQ
840 \***
850 INC &10
```

IX

See 'Random numbers', page 78

```
 860 JMP oldIRQ
 870
 880 .int_on
 890 \******
 900 SEI
 910 LDA #IRQ MOD 256
 920 STA &204
 930 LDA #IRQ DIV 256
 940 STA &205
 950 CLI
 960 RTS
 970
 980 .int_off
 990 \*******
1000 SEI
1010 LDA #oldIRQ MOD 256
1020 STA &204
1030 LDA #oldIRQ DIV 256
1040 STA &205
1050 CLI
1060 RTS
1070
1080 .basRND
1090 \******
1100 JSR bas
1110 LDA &0D
1120 RTS
1130
1140 .newRND
1150 \******
1160 LDA &0E
1170 EOR &0D
1180 EOR &10
1190 ROR A
1200 STA &0E
1210 ROR &0D
1220 ROR &0E
1230 DEY
1240 BNE newRND
1250 RTS
1260
1270 ]
1280 testcode%=P%
1290 ENDPROC
1300 DEF PROCassemble_tests
1310 REM *****************
1320 FOR opt% = 0 TO 2 STEP 2
1330   P% = testcode%
1340   [OPT opt%
1350
1360   .RNDmap
1370   \******
1380   LDA #25
1390   JSR &FFEE
1400   LDA #69
1410   JSR &FFEE
1420   LDY #8
1430   JSR rndGEN
1440   JSR &FFEE
1450   LDY #2
1460   JSR rndGEN
1470   AND #3
1480   JSR &FFEE
1490   LDY #8
1500   JSR rndGEN
1510   JSR &FFEE
1520   LDY #2
1530   JSR rndGEN
1540   AND #3
1550   JSR &FFEE
1560   LDA #&81
1570   LDX #0
1580   LDY #0
1590   JSR &FFF4
1600   BCS RNDmap
1610   RTS
1620
1630   .RNDhist
1640   \*******
1650   LDA #0
1660   TAX
1670   .wipe
1680   STA B%,X
1690   STA C%,X
1700   INX
1710   BNE wipe
1720
1730   .sample
1740   LDY #8
1750   JSR rndGEN
1760   TAX
1770   INC B%,X
1780   BNE sample
1790   INC C%,X
1800   LDA &404
1810   CMP C%,X
1820   BNE sample
1830   RTS
1840
1850   ]
1860   NEXT
1870 ENDPROC
```

See 'Teaching toddlers' page 104

Listing 1. Introducing children to micros

```
 10 REM Youngest Users Micro Activity Pack.
 20 REM (c) Joe Telford
 30 W%=5
 40 K%=-1:*KEY 10 OLD|MGOTO50|M
 50 REM THIS LINE IS IMPORTANT
 60 ON ERROR MODE6:PROCerror
 70 MODE6:PROCsetup
 80 IF K%=-1 choice=FNmenu ELSE choice=0
 90 IF choice=0 choice=K%
100 K%=choice
110 CLS:MODE5:CLS:VDU19,0,4,0;0;
120 PROCxcrsr(0)
130 IF choice=1 PROCpattern
140 IF choice=2 PROCshape
150 IF choice=3 PROCshapegame
160 IF choice=4 PROCdrawsound
170 IF choice=5 PROCsketch
180 IF choice=6 MODE7:CLS:PROCend
190 END
200 DEFPROCend
210 PRINT''"Bye.":*FX220,27
220 *FX4,0
230 END
240 DEFPROCerror
250 IF ERR= 17 RUN
260 CLS:REPORT:PRINT" @ "; ERL
270 PROCend
280 DEFPROCsketch
290 GCOL0,129:CLG:GCOL0,2:PROCrect(0,992,1280,32,1)
300 sx=640:sy=512
310 REPEAT
320 PROCcrsr(sx,sy)
330 k=FNkey
340 PROCcrsr(sx,sy)
350 IFk=0 sy=sy+16 ELSEIFk=1 sy=sy-16 ELSEIFk=2 sx=sx-16 ELSEIFk=3 sx=sx+16 EL
SEIFk=4 col=(col+1) MOD4:GCOL0,col:PROCrect(0,992,1280,32,1):MOVEsx,sy
360 IFsx>1279 sx=sx-16:VDU7
370 IFsx<1 sx=sx+16:VDU7
380 IFsy>992 sy=sy-16:VDU7
390 IFsy<1 sy=sy+16:VDU7
400 DRAW sx,sy
410 UNTIL FALSE
420 ENDPROC
430 DEFPROCcrsr(x,y):GCOL4,0:MOVEx,y:MOVEx+8,y:DRAWx-8,y:MOVEx,y+8:DRAWx,y-8:M
OVEx,y:GCOL0,(col MOD 4):ENDPROC
440 DEFPROCshape:GCOL0,col:PROCrect(0,992,1280,32,1)
450 REPEAT
460 sx= RND(1280):sy=RND(1024)
470 REPEAT PROCrect(0,992,1280,32,1)
480 PROCcrsr(sx,sy):VDU7
490 delay= TIME+W%*100:*FX21,0
500 REPEAT k=FNkey:UNTIL k>-1 OR TIME>delay
510  PROCcrsr(sx,sy)
520  r=RND(250)+50
530 IF k=0 PROCcircle(sx,sy,r,r,1):UNTIL 0
540  IF k=1 PROCrect(sx,sy,r,r,1):UNTIL0
```

Continued ►

See 'Teaching toddlers' page 104

◄ Continued

```
550  IF k=2 PROCrect(sx,sy,2*r,r,1):UNTIL0
560 IF k=3 PROCtri(r*COS(RAD(90)),r*SIN(RAD(90)),r*COS(RAD(210)),r*SIN(RAD(210
)),r*COS(RAD(330)),r*SIN(RAD(330)),1):UNTIL0
570 IF k=4 col=(col+1) MOD 4:GCOL0,col:PROCrect(0,992,1280,32,1)
580 UNTIL TRUE:UNTIL FALSE
590 ENDPROC
600 DEF PROCpattern:CLS:PRINTSTRING$(20,CHR$155);:VDU28,0,31,19,1
610 CLS:char=65
620 REPEAT:*FX21,0
630 REPEAT k=FNkey:UNTIL k>-1
640 IF k=4 col=col+1:IF (col MOD 4)=0 col=col+1
650 COLOUR col:VDU26:PRINTSTRING$(20,CHR$155);:VDU28,0,31,19,1
660 IF k=0 char= char+1
670 IF k=1 char= char-1
680 IF k=2 char= RND(127)+32
690 IF k=3 char= char
700 IF char=155 char=33
710 IF char=32 char=154
720 FOR I%= 1 TO 600:VDUchar:NEXT
730 UNTILFALSE
740 ENDPROC
750  DEFPROCdrawsound:GCOL0,128:CLG:xpos=50
760 note=6:REPEAT:*FX21,0
770 REPEAT k=FNkey:UNTIL k>-1
780 IF k=0 note= note+1
790 IF k=1 note= note-1
800 IF k=2 note= RND(14)-1
810 IF k=3 note= note
820 IF note=14 note=0
830 IF note=-1 note=13
840  GCOL 0,col:PROCplaynote(note)
850 UNTILFALSE
860 DEFPROCplaynote(n)
870  IF xpos>1200 xpos=50:GCOL0,128:CLG
880 SOUND 1,-15,n*4+52,8
890  GCOL0, RND(3)
900 PROCrect(xpos,n*70+20,100,70,1)
910 xpos=xpos+100
920 FOR wt%= 1 TO 300:NEXT
930 ENDPROC
940 DEFPROCshapegame
950 sx=640:sy=512
960 VDU19,0,5,0;0;
970 REPEAT:GCOL0,128:CLG:GCOL0,RND(3)
980 shape= RND(4)-1:r=RND(300)+50:r1=r*2
990 IF shape=0 PROCcircle(640,512,r,r,1)
1000 IF shape=1 PROCrect(640-r/2,512-r/2,r,r,1)
1010 IF shape=2 PROCrect(640-r1/2,512-r/2,r1,r,1)
1020 IF shape=3 PROCtri(r*COS(RAD(90)),r*SIN(RAD(90)),r*COS(RAD(210)),r*SIN(RAD
(210)),r*COS(RAD(330)),r*SIN(RAD(330)),1)
1030 REPEAT:REPEAT:*FX21,0
1040 FOR wt%= 0 TO 300:NEXT
1050  k=FNkey: UNTIL k>-1
1060 IFk<>shape SOUND 0,-15,5,10
1070 UNTIL k=shape
1080 SOUND 0,-15,0,10
```

See 'Teaching toddlers' page 104


```
1090 UNTIL FALSE
1100 DEFPROCsetup
1110 DIMkey$(3)
1120  key$(0)="123!""£qweaszxQWEASZX"+CHR$9+CHR$27+CHR$1+CHR$19+CHR$17
1130 *KEY0 2
1140 *KEY1 3
1150 *KEY2 4
1160 key$(1)="4567RTYUDFGHCVBN$%&'rtyudfghcvbn"
1170 *KEY3 5
1180 *KEY4 6
1190 *KEY5 7
1200 *KEY6 8
1210 *KEY7 9
1220 key$(2)="890=()-iop@IOPJKLjkl+;Mm<,>.?/"
1230 *KEY8 0
1240 *KEY9 =
1250 key$(3)="~^|\{[`_*:}]"+CHR$135+CHR$136+CHR$137+CHR$138+CHR$139+CHR$13+CHR$
127
1260 VDU19,0,4,0;0;
1270 col=2:*FX4,1
1280 *FX220,0
1290 VDU23,128,0,0,0,0,255,0,0,0
1300 VDU23,129,255,129,129,129,129,129,129,255
1310 VDU23,130,32,32,32,32,32,32,32,32
1320 VDU23,131,1,2,4,8,16,32,64,128
1330 VDU23,132,128,64,32,16,8,4,2,1
1340 VDU23,133,0,255,0,255,0,255,0,255
1350  VDU23,134,170,170,170,170,170,170,170,170
1360 VDU23,135,&11,&22,&44,&88,&11,&22,&44,&88
1370 VDU23,136,&88,&44,&22,&11,&88,&44,&22,&11
1380 VDU23,137,255,129,189,165,165,189,129,255
1390 VDU23,138,60,66,129,129,129,129,60,66
1400 VDU23,139,0,255,129,129,129,129,255,0
1410 VDU23,140,0,126,66,66,66,66,126,0
1420 VDU23,141,0,24,36,66,66,36,24,0
1430 VDU23,142,0,24,24,24,60,60,126,24
1440 VDU23,143,0,36,126,126,126,126,60,24
1450 VDU23,144,0,6,6,8,16,96,96,0
1460 VDU23,145,0,96,96,16,8,6,6,0
1470 VDU23,146,0,102,102,24,24,102,102,0
1480 VDU23,147,0,126,68,72,80,96,64,0
1490 VDU23,146,0,2,6,10,18,34,126,0
1500 VDU23,148,1,3,7,15,31,63,127,255
1510 VDU23,149,255,127,63,31,15,7,3,1
1520 VDU23,150,255,254,252,248,240,224,192,128
1530 VDU23,151,128,192,224,240,248,252,254,255
1540 VDU23,152,0,16,56,84,254,84,16,56
1550 VDU23,153,0,56,56,16,254,16,40,68,68
1560 VDU23,154,0,56,56,16,254,16,56,124,68
1565 VDU23,155,255,255,255,255,255,255,255,255
1570 ENDPROC
1580 DEF FNkey :LOCALA$
1590 A$=INKEY$(0):IF A$="" =-1
1600 IF A$=" " THEN =4
1610 IF (INSTR(key$(0),A$))>0 THEN =0
1620 IF (INSTR(key$(1),A$))>0 THEN =1
```

Continued ▶

See 'Teaching toddlers' page 104

◀ Continued

```
1630 IF (INSTR(key$(2),A$))>0 THEN =2
1640 IF (INSTR(key$(3),A$))>0 THEN =3
1650 =-1
1660 DEF FNmenu
1670 CLS:K%=0
1680 PRINT'"  Youngest Users Micro-Activity Pack"
1690 PRINT
1700 sp$=STRING$(5," ")
1710 PRINT'sp$;"Please choose from:-"
1720 PRINT'sp$;"Character patterns.......1"
1730 PRINT'sp$"Draw Shapes...............2"
1740 PRINT'sp$;"Shape game................3"
1750 PRINT'sp$"Draw Sound................4"
1760 PRINT'sp$"Sketch pad................5"
1770 PRINT'sp$"END.......................6"
1780 PRINT'sp$"Which? ";
1790 REPEAT A$=GET$:UNTIL A$>"0" AND A$<"7" :PRINTA$
1800 IF A$="6" =VALA$
1810 IF A$="2" PRINT'CHR$134;sp$"Delay? (1-9 secs) ";:REPEAT B$=GET$:UNTIL B$>"
0" AND A$<="9" :PRINTB$:W%=VALB$
1820 PRINT''"  FIT OVERLAY. THEN PRESS ANY SECTION"
1830 *FX21,0
1840 REPEAT  UNTIL FNkey >-1
1850 =VALA$
1860 DEFPROCcircle(x,y,r1,r2,f)
1870 LOCAL z,x%,y%
1880 MOVEx+r1,y:MOVEx+r1,y
1890 FORz=0TO 6.4STEP.2
1900 x%=x+r1*COSz:y%=r2*SINz
1910 IFf<>1 DRAWx%,y+y% ELSE PLOT85,x%,y+y%:PLOT85,x%,y-y%
1920 IFf=1ANDz>3.2 z=6.4
1930 NEXT:ENDPROC
1940 DEFPROCrect(x,y,l,w,f)
1950 MOVEx,y:DRAWx+l,y
1960 IFf=0 DRAWx+l,y+w ELSEPLOT85,x,y+w
1970 IFf=0 DRAWx,y+w ELSEPLOT85,x+l,y+w
1980 MOVEx,y+w:IFf=0 DRAWx,y ELSEMOVEx,y
1990 ENDPROC
2000 DEFPROCtri(x1,y1,x2,y2,x3,y3,f)
2010 VDU29,sx;sy;
2020 MOVE x1,y1
2030 IFf=0 DRAWx2,y2 ELSE MOVE x2,y2
2040 IFf=0 DRAWx3,y3:DRAWx1,y1 ELSE PLOT85,x3,y3:MOVEx1,y1
2050 VDU29,0;0;
2060 ENDPROC
2070 DEFPROCxcrsr(x):IFx=0 THEN VDU23;8202;0;0;0;:ELSE VDU23;29194;0;0;0;
2080 ENDPROC
```

See 'Zoo time for micros' page 112


```
   10 REM ***********************
   20 REM *** ACTIVITY BOARD   ***
   30 REM *** SUSAN KINGSBURY ***
   40 REM ***    BBC MODEL B    ***
   50 REM ***    AUGUST 1984    ***
   60 REM ***********************
   70 DIM B$(8)
   80 DIM D$(100)
   90 READ A$
  100 FOR I=1 TO 8
  110 READ B$(I)
  120 NEXTI
  130 RESTORE
  140 D=0
  150 CLS:PRINT"NOTES FOR TEACHER"
  160 PRINT
  170 PRINT"FRED IS VISITING THE ";A$ ;"."
  180 PRINT"AT EACH PLACE HE VISITS, A SENTENCE"
  190 PRINT"WILL APPEAR ON THE SCREEN."
  200 PRINT
  210 PRINT"WHEN HIS VISIT IS COMPLETE, PRESS P"
  220 PRINT"AND THE STORY OF HIS VISIT WILL BE"
  230 PRINT"PRINTED ON THE SCREEN AND, IF REQUIRED,"
  240 PRINT"ALSO ON THE PRINTER."
  250 PRINT
  260 PRINT"DO YOU WISH TO USE THE PRINTER?"
  270 INPUT P$
  280 PRINT
  290 PRINT"PRESS SPACE BAR TO CONTINUE"
  300 Z$=GET$:IF Z$<>" "THEN 300
  310 CLS:PRINT TAB(16,12);CHR$(141); A$:PRINT TAB(16,
13);CHR$(141);A$
  320 IF ?65120=255 THEN 320
  330 CLS
  340 L=500
  350 X$=INKEY$(0):IF X$="P"THEN 560
  360 C=(?65120)
  370 G=255-C
  380 IF L=G THEN 350
  390 IF G>0 THEN GOSUB 410
  400 GOTO 350
  410 CLS:L=G
  420 IF G=1 THEN J=1
  430 IF G=2 THEN J=2
  440 IF G=4 THEN J=3
  450 IF G=8 THEN J=4
  460 IF G=16 THEN J=5
  470 IF G=32 THEN J=6
  480 IF G=64 THEN J=7
  490 IF G=128 THEN J=8
  500 CLS
  510 PRINT CHR$(141);B$(J):PRINT CHR$(141);B$(J)
  520 D=D+1
  530 D$(D)=B$(J)
  540 X$=INKEY$(120):IF X$="P"THEN 560
  550 RETURN
  560 CLS
  570 FOR K=1 TO D
  580 PRINT CHR$(141);D$(K)
  590 PRINT CHR$(141);D$(K)
  600 NEXT K
  610 IF P$<>"YES"THEN END
  620 VDU 2,21
  630 PRINT A$
  640 PRINT
  650 FOR K=1 TO D
  660 PRINT D$(K)
  670 NEXT K
  680 VDU6
  690 PRINT CHR$(3)
  700 END
  710 DATA ZOO
  720 DATA Fred is buying a ticket to the zoo.
  730 DATA These camels have two humps!
  740 DATA Fred is frightened of the gorillas.
  750 DATA Here is a brown bear and a polar bear.
  760 DATA The keeper is feeding the sea  lions.
  770 DATA Fred is laughing at the funny monkeys.
  780 DATA What a big ice cream Fred is eating.
  790 DATA Fred is looking at the lions.
```

Listing 1. Fostering creativity in the classroom

See 'Avoiding invalid data entry', page 127.


```
100 REM  LEFT-JUSTIFIER FOR
110 REM  ATOM BASIC STRINGS.
120 REM POINTER TO STRING TO
130 REM BE ANALYSED IS PASSED
140 REM IN BASIC VARIABLE "X".
150;
160 DIM LL(4),L(1)
170 FOR N=0 TO 4; LL(N)=-1; NEXT
180 S=#80;   REM POINTER FOR STRING
190 X=#339; REM LEAST SIGIFICANT BYTE
200          REM OF BASIC VARIABLE "X"
210 INPUT"ASSEMBLE FROM (#)" H
220 INPUT"LIST ASSEMBLY (Y/N)"$L
230 IF $L="N" P.$21
240 FOR N=1 TO 2; P=H
250;
260 REM  ON ENTRY, THE X REGISTER
270 REM HOLDS THE LO-BYTE VALUE OF
280 REM THE POINTER TO THE STRING
290 REM    TO BE LEFT-JUSTIFIED.
300 REM (PASSED VIA 'LINK' COMMAND)
310[
320:LL0 STX S      \set up pointer
330     LDA X+27   \(2nd byte of BASIC
340     STA S+1    \variable 'X')
350     LDY @#FF   \Y=-1 for preincrement
355\
360:LL1 INY        \get next char
370     LDA (S),Y  \in string
380     CMP @#20   \continue until non-
390     BEQ LL1    \space char found.
400     TYA        \if no leading
410     BEQ LL4    \spaces, exit.
415\
420     LDX @0     \get non-space
430:LL2 LDA (S),Y  \chars in string
440     STA (S,X)  \and put at start.
450     INC S  .   \point to next
460     BNE LL3    \char.
470     INC S+1
480:LL3 CMP @#0D   \check if end
490     BNE LL2    \of string moved.
495\
500:LL4 RTS        \exit
510]
520 NEXT
530 P.$6
540 @=1
550 P.'"SAVE""LEFTJUST"""&H," ",&P'
560 END
```

Program 2. Machine-code version of string left-justifier

```
a)

1000 REM     ATOM BASIC STRING
1010 REM LEFT-JUSTIFIER ROUTINES.
1020 REM USE BASIC VARIABLE X TO
1030 REM  INDICATE STRING TO BE
1040 REM        EXAMINED.
1050 REM
1060j IF ?X<>32 RETURN
1070  Z=0
1080  DO
1090    Z=Z+1
1100  UNTIL X?Z<>32
1110  $X=$X+Z
1120  RETURN

b)

1000jZ=-1;DOZ=Z+1;U.X?Z<>32;
$X=$X+Z;R.

c)

1000jIF?X=32 DO$X=$X+1;U.?X<>32
1010R.
```

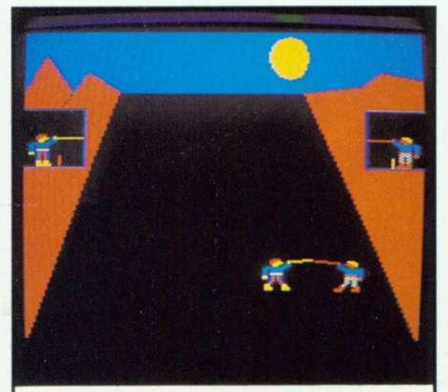
Program 1. Three Basic variations for left-justification

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SWORD MASTER is one of the few two-player games around, and is designed for joystick or keyboard.

Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutscritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between the players shown on screen as knights.

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TREK was the first game to take advantage of voice synthesis on the BBC micro – and uses joystick or keyboard.

Trek puts you in charge of a Starship with the task of wiping out an alien fleet. It's an excellent adaptation of the classic game with 7 screen displays, 3 on-board computers and 2 weapon systems.

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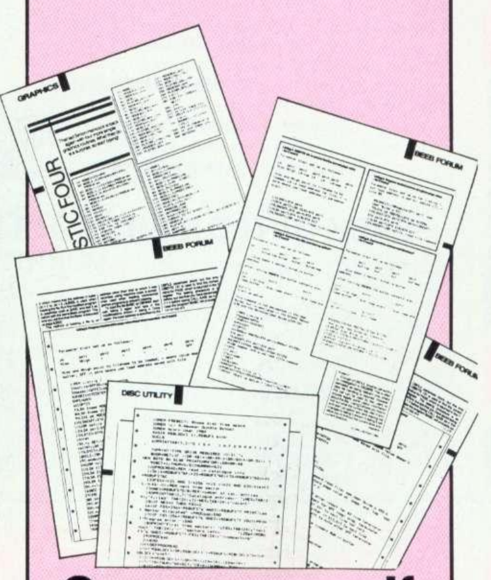
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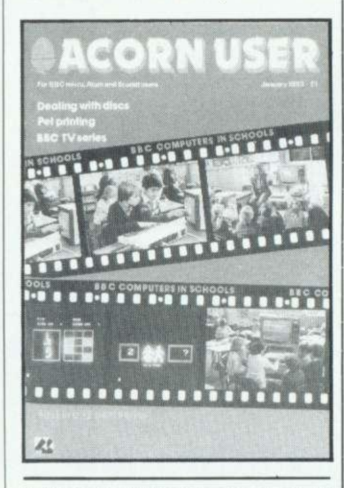
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7. February 1 MHz bus examined. 3D Atom graphics. Atom BBC Board reviewed. Machine code 4 – memory. BBC Computer Literacy update. Atom error handling. Micros in schools 2 – getting organised. Hints and Tips. Beeb Forum. Reviews of *Wordwise* and the Amber printer.

8. March Chess on the BBC micro. Sound on the Beeb. Printers for beginners. Atom analogue converter. Schools 3 – micros and maths. Machine code 5 – indirect addressing. DIY lightpen. MEP's *Microprimer* review. Atom Ross toolkit review. Beeb Forum. Assembly language and Pascal book reviews.

9. April *Hexangle* game listing. Bach on the Beeb. Hints & Tips on disc drives. Machine code 6 – the CALL statement. Interfacing the 1 MHz bus. Schools 4 – young children and micros. Graphics listings. Printers for beginners 2. Reviews fo BCPL, educational software and Atom software.

10. May Review of Basic II. Graphics listings. New *FX calls in OS1.2. Colour mixing on the Beeb. Jazz, blues and folk on the BBC. Schools 5 – language development. DIY Beeb interface box. Atom sound board. A to Z of printing: how to get going. Hints and Tips: PROCs, discs and FNs. Printer, software and book reviews.

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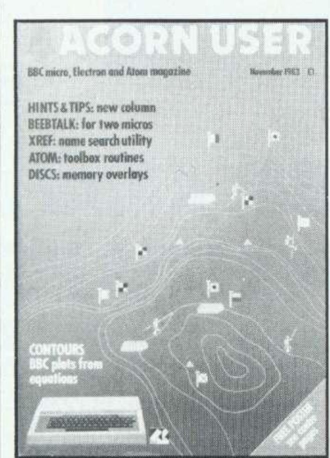
12. July Techniques – hash tables. Hints and Tips: logic made easy. Recursion and graphics. Handling strings. Two ideas for passing variables. Beeb aids the blind. DIY second keyboard. Beeb Forum. Sounds on the Atom. Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps. Techniques – Tree structures and sorting. All the fun of the fair. 40/80 disc copier. Colour painting. Basic II: random access files. Screen dumps for Olivetti, Centronics and Seikosha. Atom strings. Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

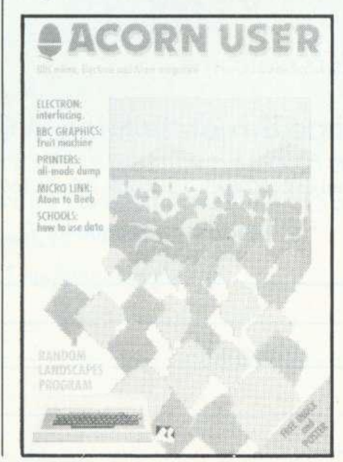
14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*. Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

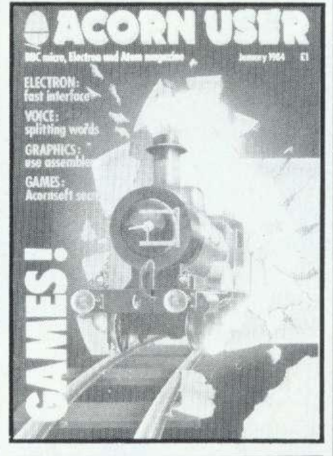
16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler ultilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.



18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure. Reviews of ultilities, software, *Beeline* wordprocessor, educational packages, two chess programs.



19. February: Adventures special issue Techniques – efficient sorts. PROC for a numeric keypad on the Beeb keyboard. 12 graphics listings. Random access filing on disc. Locking files. MCP40 printer/plotter looked at. Hints & Tips. Beeb Forum. Make discs readable on 40 and 80 track drives. Screen memory organisation. Hints on adventure design. Adventure action. Adventure ideas in computer language. Text compression. Word-crunching. VIA chip on Electron to drive a parallel printer. Atom Forum. Schools – simulation packages. Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp 1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV. 6845 chip explored. Advanced filing systems. Lisp 2. Hints & Tips. Beeb Forum. Choose disc tracks to copy. Function key editing. Teletext dumps. CES scrutinised. Passing variables. Computer Concepts' graphics ROM. Schools – simulations. Calculating Easter dates. Better programming. Atom Forum. Atom ROM routines. Converting BBC to Atom Basic. Three printers compared. Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.

22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.

23. June Acorn Z80 second processor. Forth. Graphics to brighten up your games. Soft Pottery graphics. Go faster and save memory space. Rapid search and load routine for tapes. How the Beeb and Electron work 1. Business: reviews and how to gently enter office computerisation. Education – adult literacy. Dumping Atom programs on the BBC. Atom Forum. Software copyright laws. Hints & Tips. Techniques – B-Trees. Beeb Forum. Reviews of monitors, printers, books, software, adventures, EPROM programmer.



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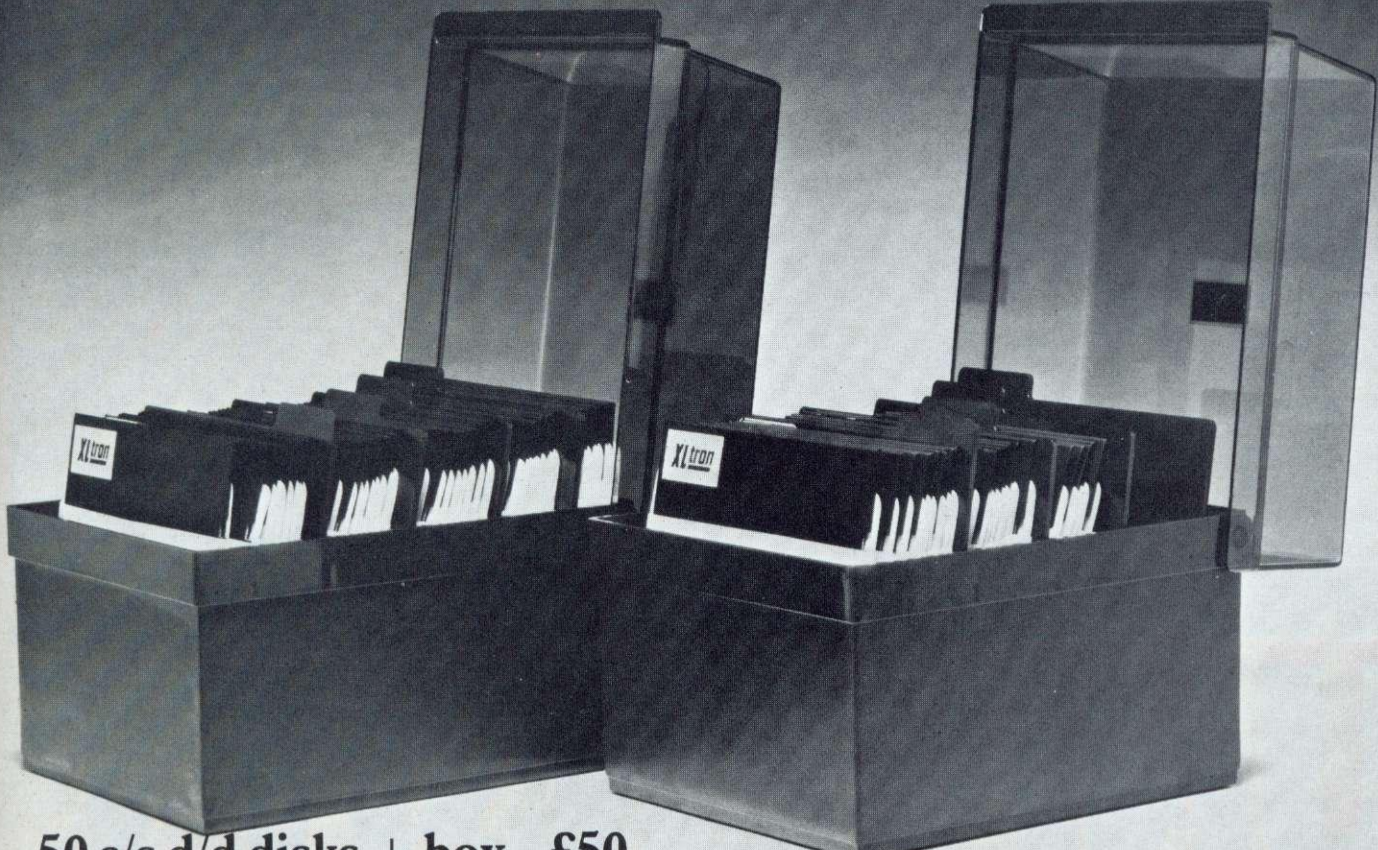
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RECENTLY we received a communication from our old friend Mad Alex saying that his very own competition would shortly be on its way to us. Since Mad Alex was then messing around with the laws of time we had in fact received it three days earlier.

A close examination revealed that he had sent it from Ambridge up to a passing asteroid which had deflected the signal onto a satellite. The message was then bounced off the moon into a NASA computer in Houston and a carrier pigeon brought the printout across the Atlantic to our offices in Long Acre.

Unfortunately, Alex seems to have got his ASCII in a twist so we're not quite sure what the competition is. However, Torch Unicomm packages comprising modem and three software packs await the first five people out of our sack who have deciphered the message and solved its contents. The answer should be in the form of 12 phrases. Answers on a postcard please to August Competition, *Acorn User*, 68 Long Acre, London WC2E 9JH, to arrive not later than September 3, 1984.

Simon Dally

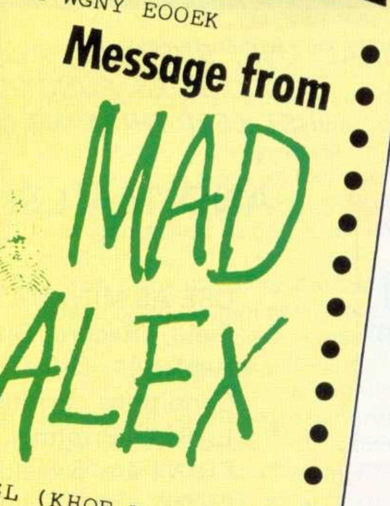
Turn to page 161 for an exclusive review of the Unicomm system

COMPETITION RULES

THE names of the winners of this competition will be printed in the November issue, and they will be notified by post before then. Please note that we cannot accept any phone calls or correspondence on the competition. Also, we cannot return entries.

Having said that little lot, good luck!



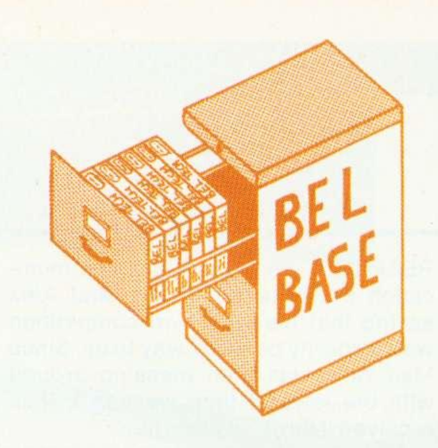


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KHWD AGVZM.  KGJO WGN VHZO CW QOU YMAGNY-EUG-EKYOO
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DQMUOY HM MHIEOOQ GNQROM HQ D JGNQS
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EUOVXO M GA EKO P
AHAEW AGNY R HQ D S (UHEK EKO T)
OHLKEOOQ K GQ D LR
EUG KNQSYOS J AGY JL HQ C
EKYOO FC (MKEY)
EUOQEW AGNY K HQ D S
AHAEW MOXOQ KX
EUOQEW QHQO S HQ A HQ D VW
EUOVXO J HQ D RE (HQRVNSHQL EKO EC)
HA WGN MGVXO EKDE VGE WGN MEDQS D RKDQRO GA UHQQHQL
GQO GA EKO CGSOCM.
FW EKO UDW, EKO BNHRZ FYGUQ AGI TNCJM GXOY EKO VDPW SGL (KHQE KHQE).
JHJ JHJ JHJ
```


Decipher the message to reveal 12 phrases

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PLAN FOR $ BUSINESS £

John Vaux takes a look at the wordprocessor, card index and spreadsheet with Acorn's Z80

THE BUNDLED software that Acorn is supplying with its Z80 second processor was summarised in an outline review in the June issue of *Acorn User*, and last month we looked more closely at the *Accountant* package from Compact Software International. Now it's the turn of a set of three programs written by Chang Laboratories, the *Plan* series. This set consists of a wordprocessing package called *MemoPlan*, a card index type system called *FilePlan*, and a spreadsheet program with graphics output called *GraphPlan*.

MemoPlan

MemoPlan is an interesting-looking wordprocessing program with some nice features not found in comparable programs. In addition to most of the facilities of other packages it will let you work on more than one document at a time, switching between them on a function key.

You may also have two documents on the screen together and hop from one to the other. Another unusual feature is that documents are automatically written to disc at regular intervals while you work on them.

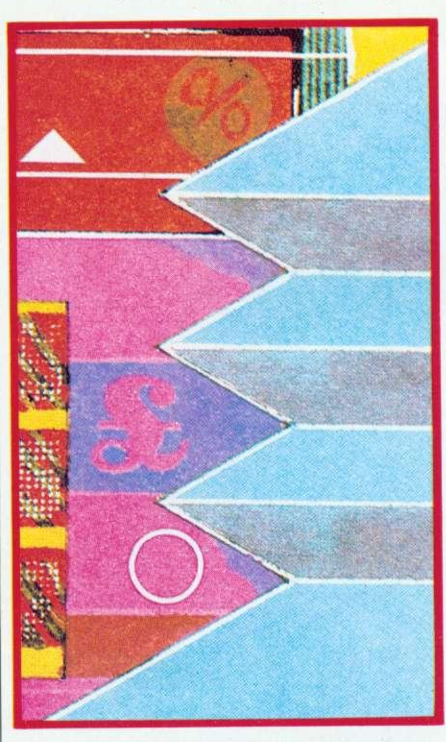
Most commands are provided on the function keys, either alone or in with Shift or Control.

As is usual, typing is done continuously, new lines being started automatically. Pressing RETURN is not required unless you want to start a new line or new paragraph. New pages are started based on the prespecified number of lines per page. A new page may be forced using a strange combination of keys (no function key for this one) and there's an indicator in your text that this has been done.

The only special printer attribute supported is underlining and portions of text may be underlined using a special function key, although there is no on-screen indication that text has been underlined. Operations provided on function keys include delete word/line/paragraph, full cursor control on the arrow keys, insert, overwrite and right justification modes.

Line length setting, indentation and tab positions are provided for. These are easily changed using the format command. Text can be reformatted one paragraph at a time using the reformat key.

A word, line or paragraph may be



moved by deleting it, moving the cursor to its new location and pressing the restore key.

The text remains available until the next delete so it can be restored to several places. You may also move blocks of text by putting the cursor at the start, pressing the mark key, moving the cursor to the end of the block, pressing the lift key, moving the cursor to the new position and pressing the restore key – easier to do than describe! Again, text may be duplicated by restoring several times.

All the usual search and replace facilities are provided, including search only, automatic find and replace and selective search and replace, in which you are prompted before each replace operation. A sensible precaution, as it's easy to make changes you didn't intend. You may order matching on capitals and non-capitals or on capital first letter only.

Now we come to one of the especially attractive features of the program. By default five document areas are provided. This may be changed (but only if there is no data currently stored) to any number of areas from 1 to 7. Total space reserved for these documents may be set in multiples of 8k from 16k to 160k. This is only the working document area within *MemoPlan*; you may also save documents to disc in the normal way.

You can switch between these documents on a function key. As it brings the document onto the screen it positions the cursor at exactly the point it occupied when you left it.

There's more! You can display two documents at the same time, one above the other, and hop from one to the other. You can scroll them independently, change the number of lines occupied by each (yes, variable-sized windows) and move text from one to the other. This is a powerful feature and I was impressed to find it in this 'free' program.

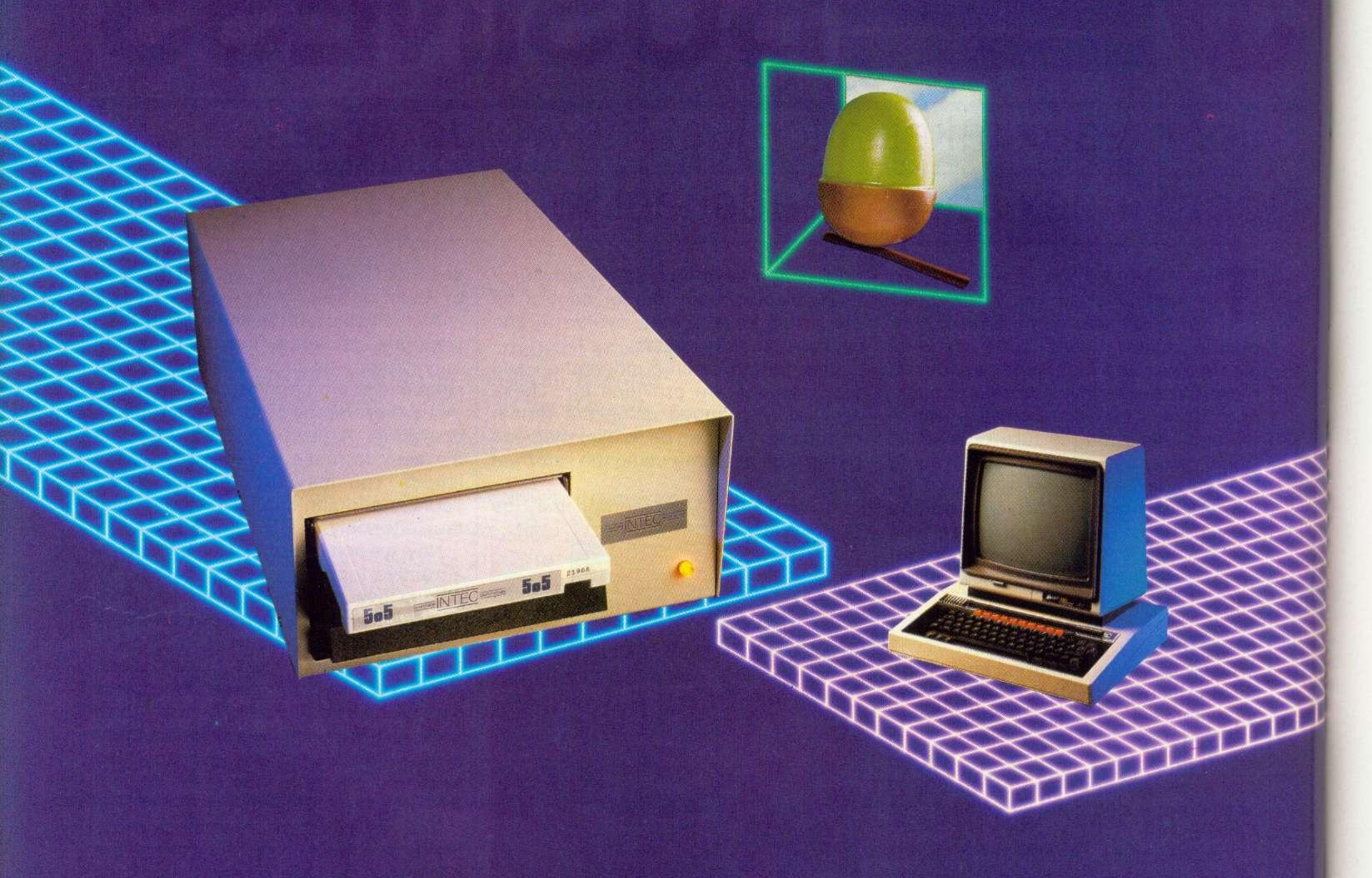
Two types of printer are supported – Epson or equivalent and Acorn/Olivetti ink-jet. For any other types you are advised to consult your dealer.

Printing is pretty straightforward, without a lot of the extra features of, for example, Wordstar. You can ask for several copies, specify page numbering, page headings, and there are other options. These features should be adequate for most purposes.

It's quite easy to set up a mail-merge,

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using the wordprocessor in conjunction with *FilePlan*, even though the procedure is split across two manuals.

A minor problem of *MemoPlan* is that function key 9 is used, and this is adjacent to the break key. Hitting the break key aborts the program, but all is not lost, thanks to the automatic back-up of documents. You restart the program and it tells you to run the recover program, which restores you to where you were last time the auto back-up was done, so you should lose little.

This excellent wordprocessor is worth most of the price of the second processor alone. I was brought up on *Wordstar*, which is the one the rest are judged by, and I have no hesitation in comparing this one favourably with it. There are pros and cons, of course, but I used *MemoPlan* to prepare this article and was very happy with it. The documentation is very good and in the same style as that for the rest of the software provided.

FilePlan

In this computerised filing system records may be updated, sorted, selected and displayed or printed. As noted, *FilePlan* can also be used in conjunction with *MemoPlan* to give a mailmerge facility to print address labels and/or customised letters.

The records are processed on the screen in a form of worksheet, a textual version of the more familiar spreadsheet for manipulation of numeric data. The whole worksheet is a file, each row is a data record and each vertical field within a record (ie a cell) is an item of data.

Records may be sorted on a field or a number of fields to give a sorted list, or selected on specified criteria to give other lists. Any worksheet or list may be displayed or printed.

Default record size is 100 characters and this may be increased to about 800.

Before using a worksheet for the first time it must be named and each field specified as to its name, length and type, etc. A useful facility here is that you may specify your own prompt message to appear when a field is to be filled in on data entry. You can also provide a list of valid codes to be used to check input data and which expand valid data, for example, M = male, F = female. Range checks may also be made.

Full use is made of the function keys for data entry. The cursor up, down, left and right keys, together with Control and Shift, are used to move around your worksheet, which appears like a spreadsheet on the screen with the current cell or field highlighted. At each cell the relevant prompt message appears and data is entered or changed. The manual does not say how to delete a record – I presume this is done by deleting the data in all fields. New records are added at the end of the worksheet.

MemoPlan: compares favourably with Wordstar

Lists may be generated either by selection or sorting or both. Selection is done by specifying a field, an option (eg, equal, less than, between) and a value (or a pair of values if the option is 'between'). Lists may be merged, either by making an additional selection or by merging existing lists.

Sorting may be performed on the original worksheet or on a list generated from it, and it can be done on any number of fields in a record. Sorting is done in ascending sequence – there is no facility to sort in descending order. You can also select for one record on the worksheet. Your worksheet is displayed starting at the selected record, if found.

You can print out a dictionary giving full details of every worksheet and list. Original worksheets or lists may be printed. You can specify a heading, a date, single/double spacing or subtotalling on numeric fields. Over-wide prints can be truncated or continued on the next line. Label prints prompt for full details to ensure correct alignment.

A single record can be displayed field by field vertically – useful for large records that don't fit on a single-line display.

Worksheets may be copied, with the option to expand the space allowed for each record.

FilePlan is another professionally presented package with good, well-produced documentation. It performs its task of implementing a simple indexed data storage and retrieval system adequately, without pretending to be a full database system.

GraphPlan

The third package in this group is a traditional spreadsheet application with the addition of useful graphics options. For anyone who still doesn't know, a spreadsheet is a large grid of rows and columns in which you can enter and manipulate numeric data (usually financial). The display screen serves as a movable window on this data, showing at any time a whole screenful of data. Facilities are provided for rapid recalculation of the data, allowing 'what-if' changes to selected parts of the data to be performed. *GraphPlan* allows arrays of up to 1,000 elements or 'cells' – on the low side compared with other products.

The screen display consists of three lines at the top for messages, prompts and data entry, and down the right side the current level of menu options, the rest of the screen being occupied by the spreadsheet itself. This has row and column headings and the current cell is indicated in inverse video. With default field sizes this allows a 17 row by 5 column window on the data.

Working effectively with a spreadsheet is a creative activity so it is advisable to plan what is required in advance (a good example is presented in the very helpful manual). Having done this, making and using the spreadsheet is pretty straightforward.

A minor quibble here is that the commands are numbered from 1 to 144 (with a few gaps), which makes it difficult to remember them. Some of the more common ones are mentioned on

the function key overlay card but no use is made of the function keys themselves. They all appear in the list on the screen but I prefer alphabetic mnemonic codes.

Space does not permit me to go into all the options, but virtually all the facilities you'd expect of a good spreadsheet program are there somewhere. For instance, in data entry, you can enter actual values and extend them by row or column by a percentage growth rate or an incremental value (linear growth). Extensive mathematical and statistical operations are also provided, and these include growth rates, moving average, standard deviation and variance.

At first I had problems persuading graphs to appear on a monochrome monitor. Turning up brightness and contrast full gave a dim graph. A call to Acornsoft produced the answer: you have to specify 'no colour' when setting up the graph attributes. Once I'd done that some fine graphs were produced.

Indeed, the graphics available are very impressive. Three types of graphical output are provided: line graphs, bar charts and pie charts. The first two can be mixed on one display and bar charts can be adjacent or stacked, whichever suits the data being shown. Output can be to screen, a printer with dot graphic capabilities, or a plotter. If colour output is available up to three colours can be specified – green, red or blue. Up to six types of shading can be specified for bar or pie charts. Portions of a bar chart may be 'exploded' to stand out from the circle. The options provided are comprehensive.

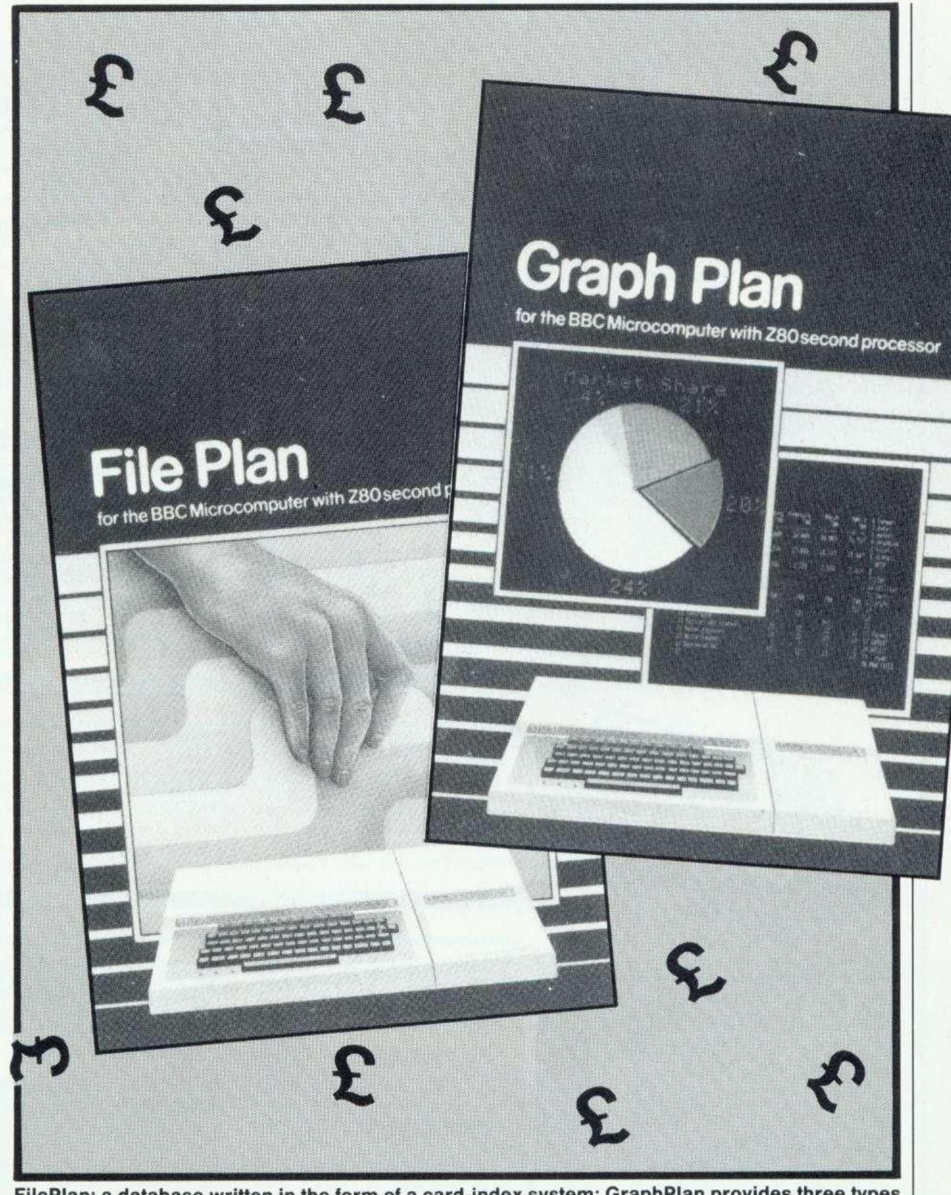
GraphPlan stands comparison with any of the similar packages available at around the £200 mark, apart from the maximum size of the array. It is fast at recalculation and the graphics are excellent.

Summary

This trio of Chang packages shows a consistent professionalism in implementation and documentation. *MemoPlan* is a capable wordprocessor with impressive features; *GraphPlan* is a good spreadsheet program with excellent graphics; and *FilePlan*, while not as outstanding as the others, is a perfectly adequate contender in its field.

If you upgrade your BBC micro into a business machine by adding the Z80 second processor, you'll be pleasantly surprised when you start using your 'free' software. It is of a quality you'd have been happy to pay for.

Next month: The Nucleus program generator and the program languages that are bundled with the Z80.



FilePlan: a database written in the form of a card-index system: GraphPlan provides three types of graphics

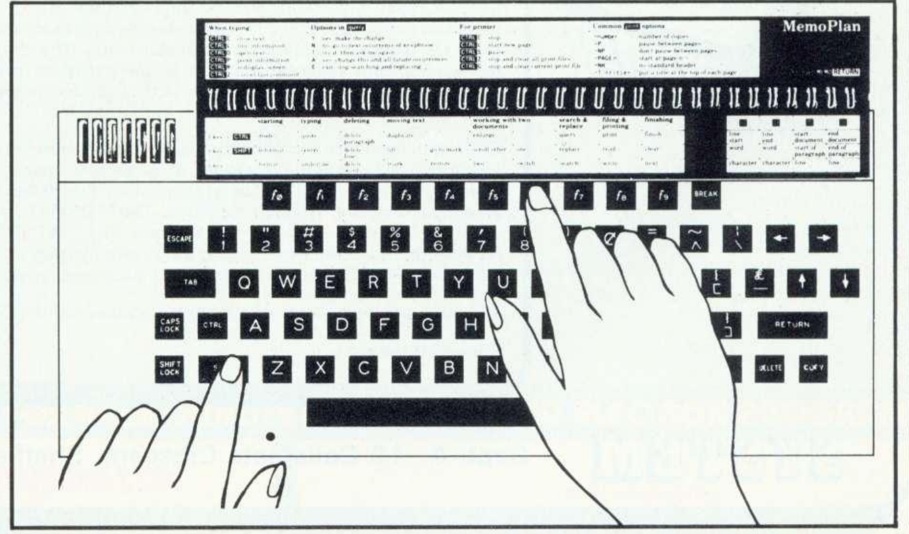


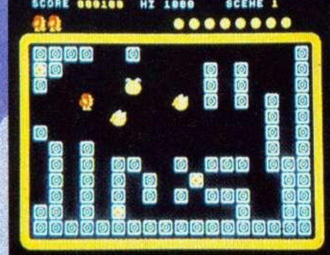
Diagram reproduced from the MemoPlan manual showing the function key strip booklet

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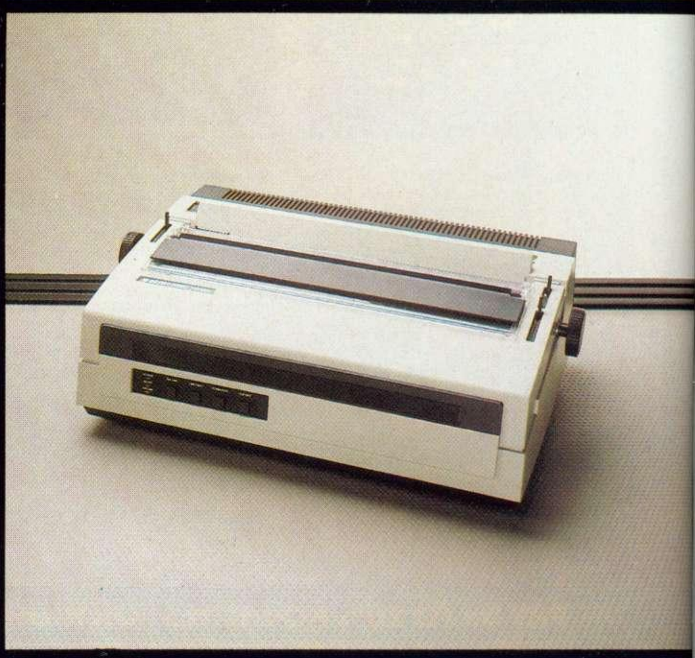
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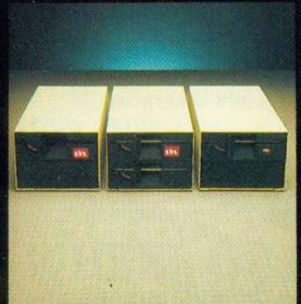
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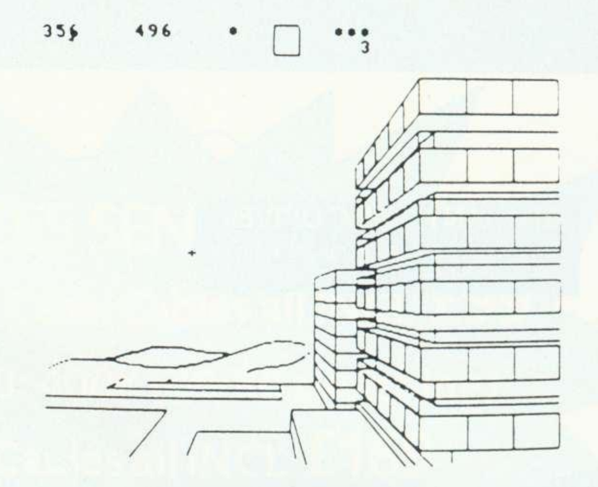
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HMS BASIC ENVIRONMENT is specifically an aid to BASIC program development designed to encourage the creation of well-structured readable code in circumstances where memory becomes a constraint. Procedures to handle screen I/O, cursor switching, CLI invocation, and keyboard validation are provided, with a linking BASIC source-file compressor which includes variable name compression to two bytes. The ability to link as many BASIC source modules as desired into a single condensed running version resolves the coder's conflict between space and intelligibility; 60% compression is effected on our sources for the above accounts packages.

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Prestel mode features full colour Prestel graphics including double height and flashing characters. Full Telesoftware capability is offered allowing the many free programs offered by Micronet 800 to be downloaded into your computer. Pages of particular interest may be 'marked' for later retrieval and display. Page images may be copied and saved to a file on the current filing system.

Terminal Mode
In terminal mode all input may be copied into a buffer in memory or spooled directly on to disc. Full control over buffered data is provided allowing it to be listed to screen or printer, sent to the RS423, saved to or loaded from the current filing system (including TAPE).
Commstar allows full configuration and easy control over the protocols used. Send and receive baud rates, word length, parity and number of stop bits are selected from a simple table of options.
When in chat mode (80 or 40 column), characters transmitted by the host will be displayed on the BBC screen and characters typed on the BBC will be sent to the host.
Commstar allows ANY type of file (not just ASCII) to be transferred 'safely' using XMODEM protocols. In fact, four individual methods of transmission are provided for within Commstar giving great flexibility.
Using a disk based 'emulation file' Commstar can be configured to emulate virtually any terminal type including VT100, within the capabilities of the BBC.
In addition to the above, most MOS commands can be executed from within Commstar, errors are trapped by Commstar's own error-handling routines and an optional elapsed time clock may be displayed. Data filter, Local Echo, Auto-line-feed, printer on/off and XON/XOFF protocols may be toggled in or out by a single key press, extensive use being made of the function keys.
Finally, Commstar may be fitted into any of the sideways ROM sockets and is provided with a comprehensive manual.
£34 inc. VAT & Carriage.

TOOLSTAR

A revolutionary new approach to program development aids.
Toolstar is a powerful new utility Rom that will open up a whole new world for BBC micro users. *Toolstar* adopts a revolutionary new approach to program development aids. It has been designed specifically to assist both Basic and Machine code programmers by providing an integrated set of powerful building blocks which rapidly become an indispensable complement to the built in facilities of your BBC micro.
This package contains the *Toolstar* firmware in Eprom and a very comprehensive manual (over 150 pages), containing many examples and illustrations to help you make the best use of *Toolstar's* exciting capabilities.

Toolstar sheds new light on your BBC micro
Toolstar, being Eprom-based will be permanently resident in your computer allowing all of its commands to be immediately available. It is 'transparent' to both the user and the operating system; once a command has been executed, control is returned to Basic, or whichever ROM had control prior to the command.
Full error handling has been incorporated and for new users there are full help menus describing each command and its syntax.

Powerful building blocks for Basic programmers?
Within *Toolstar* there are 22 commands, 8 of which operate between PAGE and TOP ie. on the current Basic program or Basic programming environment. These commands obey standard Basic command syntax rules.

Reveal the deepest secrets of your discs
Toolstar allows the operations of Formatting, Verifying, reading or writing a disc sector to be carried out very simply from Basic i.e. all the necessary building blocks required to develop a comprehensive set of disc utilities, simply and effectively.

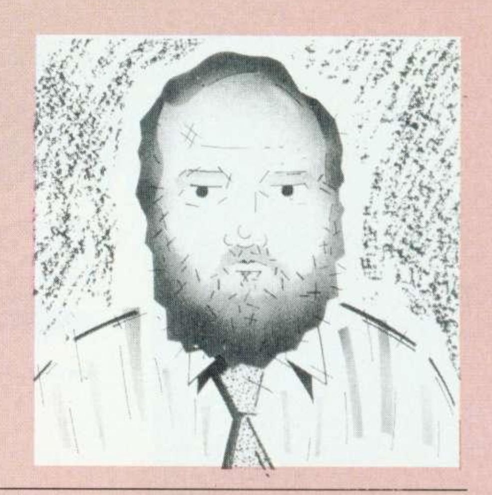
Lost your memory? – No more amnesia with Toolstar!
In addition to the commands described above there are 9 commands which operate on the whole of the BBC's memory and are designed to complement the BBC's built-in assembler. These include a full feature dissassembler and memory dump, each with forward and reverse scrolling.

If this is not enough *Toolstar* can be Extended!
There are three help menus on Toolstar which may be obtained by typing HELP TOOLS, *HELP MCODE or *HELP EXTEND. The third option menu will intially display the following:
*HELP EXTEND
EXTEND <RAM adds>
i.e. typing *EXTEND <address> will allow the user to extend the facilities of *Toolstar* with routines which are supplied by himself. The manual describes fully how this operation is carried out and illustrates it with several examples.
In the future such utilities will be made available on disc and cassette from Pace, thus allowing a comprehensive library of utility programs to be built-up.
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TEACHING TODDLERS

Fun and learning for children as young as two with programs and micro overlays from Joe Telford

THE ideas and programs in this month's Jottings form an activity pack aimed at the youngest users. Toddlers, children in nursery or early primary classes should all be entranced, and six-year-olds too might find it interesting though many will already have keyboard skills in excess of this pack. The programs aim to get young infants playing with the computer, and give parents or teachers the chance to introduce and talk about the computer and related activities. Children will be introduced to basic concepts in shape, sound, pattern and colour, which, combined with discussion and guidance from adults, help develop reasoning skills.

The ideal way to use the pack is to allow children to work in small groups and explore each application—far better than a silent single child sitting in front of a computer. If a one-to-one situation does occur, the parent or teacher should spend time with the child, talking with and listening to that child's ideas and thoughts. This is where the value of this activity pack lies.

The programs are based around a number of activities, forming a larger program called *Yumap* (youngest user's micro activity pack). Although each section can be used by children, selection is best done by an adult, as an amount of reading is required. On chaining *Yumap* a menu page is shown which offers the choices:

1. Character patterns
2. Drawing shapes
3. Shape game
4. Drawing sound
5. Sketchpad
6. End program

Each section is described on pages 107 and 108, while the overlays for each are printed opposite and overleaf. The listings are on yellow pages xi-xiv, and on our listings cassette (see page 82).

Keys and colour

Whenever the break key is pressed the program ends, restarts, finds the correct section and returns to it. All that appears to have happened is that the screen has cleared. You might like to use this 'clear screen' facility by marking where the break key is found on each overlay.

The escape key has been reconfigured to act only when CTRL and @ are pressed together. This returns the program to the selection menu, and is sufficiently well hidden to prevent children from accidentally causing such an event.

In the three sections with coloured crayon symbols, the current colour is indicated by a band at the top of the screen. If this band is not visible (in choices 2 and 5), the colour used is the background colour and rubbing out will take place.



Fitting the overlays

Each overlay can be coloured and laminated or covered with transparent adhesive plastic to make it last. Before fitting an overlay, make a firm crease along the dotted line so that a strip of about one inch of overlay is folded downwards. Next fit the top strip of the overlay (containing its title) under the clear plastic function key holding band and adjust it to cover most of the keyboard. The part of the overlay already folded will now fall close to the front casing of the micro. Fit a large elastic band around the micro and trap this flap under it. The overlay should now be secure and ready for use.

Although any area of any panel can be used, it is best to actually press a figure as these are generally most central. An adult may need only one finger but small hands can also do the job.

Inside the program

Figure 1 shows the main sec-tions of the program, and the table of frequently used pro-cedures shows these are split into two. The first group con-sists of graphics procedures for drawing triangles, rec-tangles and circles (see past Jottings). The second group includes two utilities, one for drawing a cross in the inverse screen colour and the second to make the areas of the keyboard match the areas of the overlays.

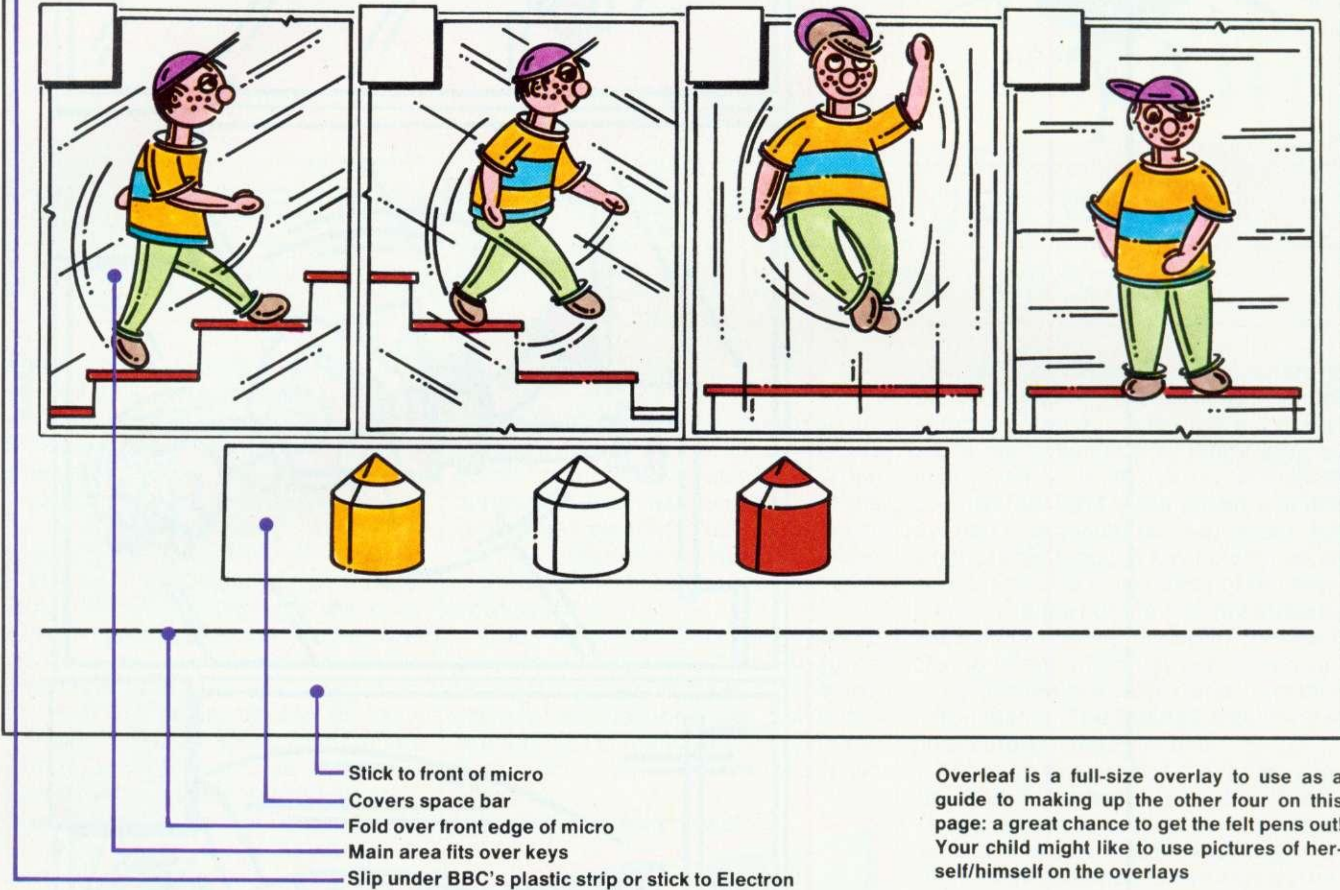
In the PROCsetup pro-cedure one task is to allocate characters to a string array. Whenever the keyboard is pressed a character will be generated and placed into A$ at line 1590. A$ is then compared using INSTR$ to each of the items in the string array 'Key$(' and, depending on where it is found, a number is returned to the calling routine. This number is 0 if a key below the leftmost panel is pressed, 1 is generated by the next panel, 2 by the next, 3 by the rightmost panel and 4 by the space bar (colour panel). *page 108*▶

DRAW SOUND - NOTE PLAYER

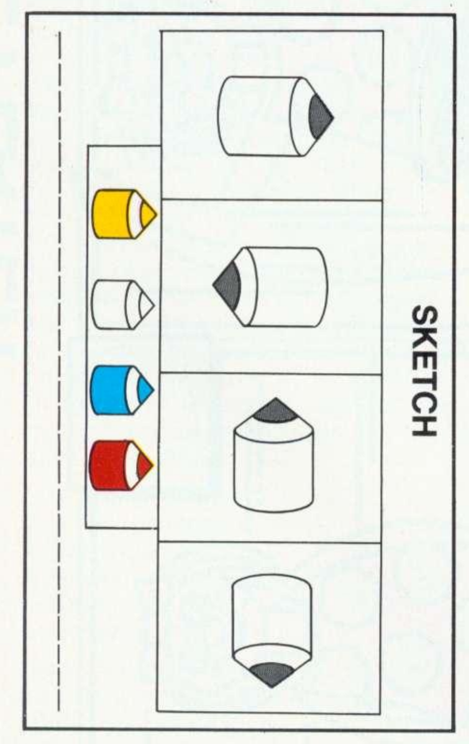


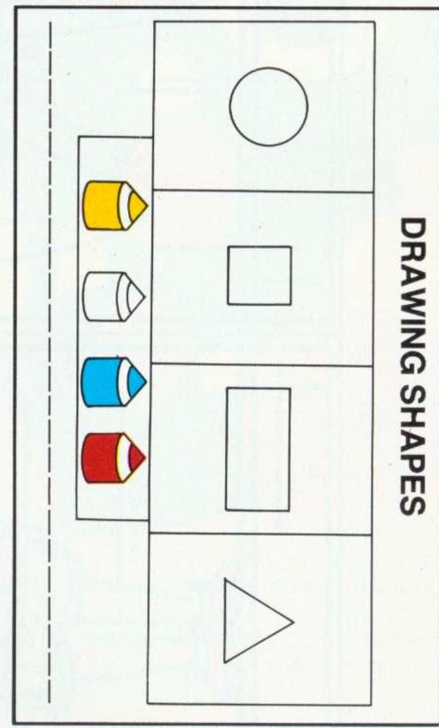
Cut out this full-size keyboard overlay and use as guide for other shown reduced overleaf

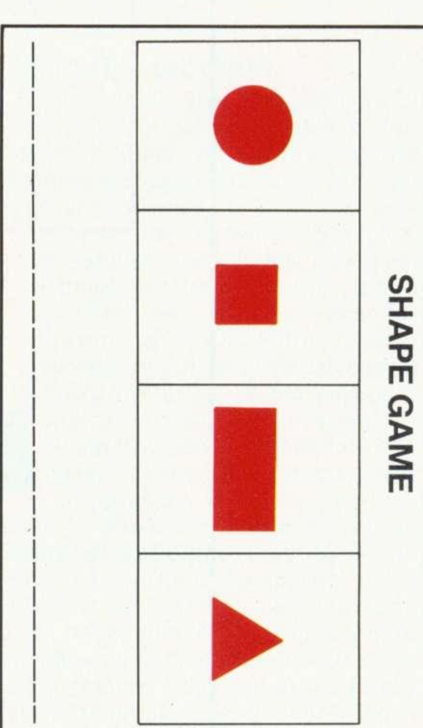
CHARACTER PATTERNS



Overleaf is a full-size overlay to use as a guide to making up the other four on this page: a great chance to get the felt pens out! Your child might like to use pictures of herself/himself on the overlays







1 Character patterns

On typing the number 1, a message appears which instructs the adult to attach a keyboard overlay to the computer (see instructions at the end of this article). In this case, the overlay to use is the one marked *Character patterns*, which contains pictures of four children in panels, plus drawings of three coloured pencils. Once fitted, a panel of the overlay can be pressed to start the character pattern section.

The screen now obeys the instructions given by pressing any of the panels. When the panel of the child walking upstairs is pressed, the pattern on the screen will move forward through a pattern sequence. This sequence used consists of 123 items, including upper and lower case alphabets, numbers and graphic characters. After the last character the sequence will restart.

If the 'child walking downstairs' is pressed the characters will be displayed in reverse sequence. If the 'jumping child' is pressed, characters are displayed in random order, while the 'standing child' maintains the currently displayed character. At the beginning, the first character displayed (by pressing 'child standing') will be 'A'.

The colour of the characters is yellow at first, but pressing the fifth panel showing the coloured pencils steps through yellow, white and red, then back to yellow.

The children can use this section to explore the relations between patterns, and parts of patterns, and to stimulate discussion about their findings. They will see discrete shapes, patterns formed by repetition of these shapes, and patterns which seem to merge together. Talk to them about heart or rocket shapes, stripey patterns and rows, lines or boxes. Children can then move on to practical pattern activities such as drawing, colouring, painting, sticking, mosaicwork or even potato printing.

2 Drawing shapes

On typing the number 2 at the menu, a message appears which asks the user to enter a delay time (between one and nine seconds) for the children using the program. To start, set it to nine seconds, then reduce it as the children get quicker. Next, a message instructs the adult to attach the overlay marked *Drawing shapes* which has four shapes in panels, plus four coloured pencils.

The start screen is blue and then a small cross appears, to the sound of a beep. This will move every nine seconds (or as per your setting), beeping as it does so. Children will need to follow the cross, because that's where all the action occurs. Pressing any panel produces a shape of random size in the current crayon colour, and its position will be indicated by the cross on the screen. The four shapes are circle, square, oblong and triangle. The initial shape colour is yellow, but pressing the crayon panel steps the colours through yellow, white, blue (which rubs out) and red, then back to yellow. Shapes may be drawn on top of each other in any colour, though the cross and shape size move at random.

The shapes panel lets children investigate and explore positioning and overlaying shapes, as well as the shapes themselves. Language is developed as the children describe what they have done and what they are about to do. Problems can be set, ranging from a simple 'Can you show me a circle?' to a more complex 'Can you put a red triangle between those two circles?' Matching exercises can also be performed, such as 'I have put three red circles on the screen. Can you show me the same number of yellow circles?' Children can develop other shape ideas, with or without the micro, using cut-outs and cards.

3 Shape game

Typing the number 3 at the menu results in a message to attach the keyboard overlay marked *Shape game.* Pressing any of the four shapes in panels starts the game. The screen clears to a purple background with a shape in the centre. This shape will have a random size, and the aim of the game is to make it vanish. This can only be done by the child recognising the shape and pressing the matching shape on the keyboard overlay. If the wrong one is pressed, a hissing noise is heard, while a correct match gives a buzzing sound and the shape vanishes. Another shape takes its place and the game continues.

In this section variation in size adds to the interest, because the children have to realise (for example) that a square is a square no matter what size it takes. The random colour of any shape emphasises the fact that colour is not an attribute of any one shape. Children might learn to recognise the simple shapes using this section, but without discussion and further practical work they will be learning without understanding. Follow-on work is closely related to that from the last section, though it would be particularly useful to allow the children to experiment: 'Can you make that oblong stand on end? It didn't when we used the computer. Is it still an oblong?'

4 Draw sound

Menu option 4 asks for the overlay marked *Draw sound – note player.* This has four human figures in panels, pressing any one starts the section and the screen turns blue and rectangles can be painted on the screen, each given a random colour. The height position of each rectangle on the screen indicates its pitch in a range of just over one octave. Adjacent rectangles are a semitone apart. Control over the sounds generated is by pressing a panel. The first panel shows a man walking upstairs and pressing this makes the note played go one semitone higher. After the highest note the sequence will restart from the lowest note. The 'Man walking downstairs' plays the note one semitone lower. After the lowest note the sequence will restart from the highest note. If you press the jumping man, notes will play at random, and the man standing repeats the note played at the same pitch.

Whenever the screen is filled, it will automatically clear and the next note played will be displayed at the left of the screen, at the selected pitch.

The children can use this section to investigate informally the relationships between musical sounds. Much adult input is needed because words like Up and Down, High and Low, Same or Different may all be introduced. Children can be set musical tasks, or be asked to set each other simple problems. For example 'Can you make the man walk upstairs?' or 'Can you make the sound go up three stairs then down 4?' or 'Can you make the sound of a police car?' Conventional musical instruments such as xylophones can take the explorations further, eg, 'Can you find that note on the xylophone?' Parents will soon find that many young infants do not find such tasks easy.

5 Sketch

On typing the number 5, a message appears which instructs the adult to attach the overlay marked *Sketch* which shows four pencils in different orientations, each in a single panel, and four crayons together in one panel. Press any panel to start and the screen clears to red with a cross in the centre. This cross can be moved up, down, left and right by pressing the appropriate pencil. As the cross moves it leaves a line behind it in the current crayon colour. Pressing the colour panel changes the initial yellow through white, blue, red (for rubbing out) and back to yellow. This section has an auto-repeat that allows the pencil to draw as long as a panel is held down.

The sketch routine gives children the chance to draw perfectly straight lines, and to build up shapes. Children can be asked to make bricks, boxes, nets, mazes and many other objects.

◀page 104

If none of these panels is pressed −1 is returned.

The aim of PROCerror is to display any error in program execution. If the relocated escape key is pressed this procedure forces a reRUN.

PROCsetup does several housekeeping tasks. It sets up the function keys, the sections of the keyboard, the cursor keys, the initial 'crayon' colour, the relocation of the escape key, and a number of defined graphics used in PROCpattern.

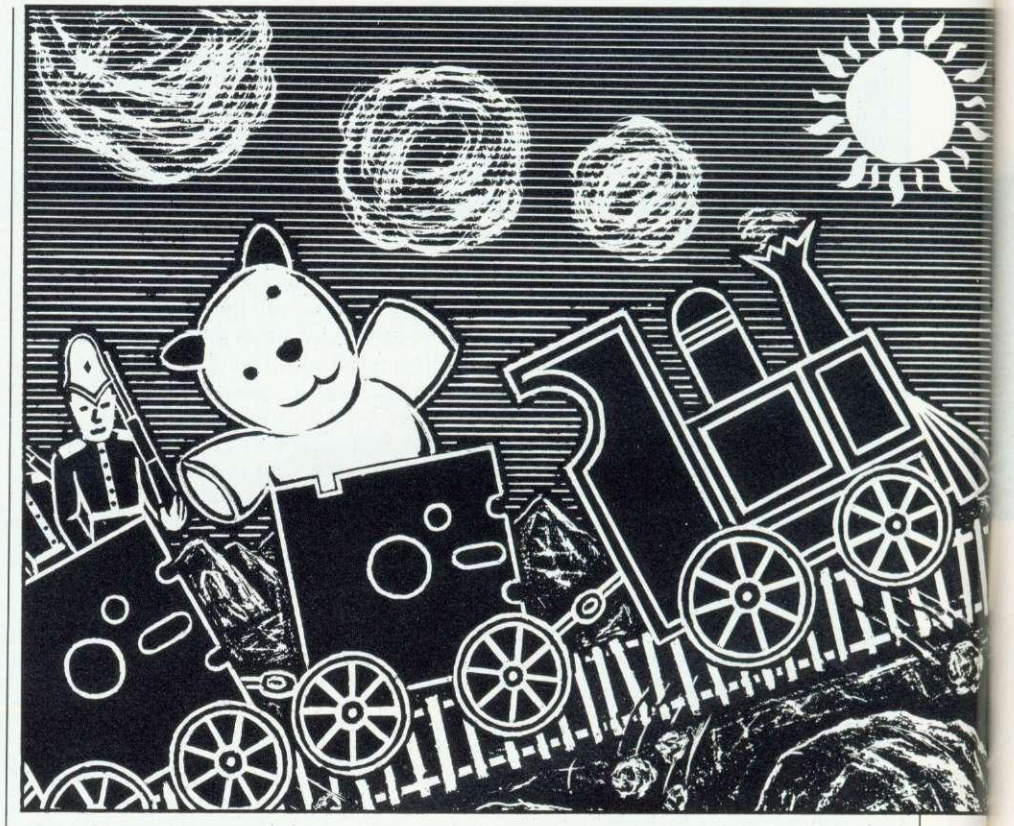
The function FNmenu handles selection of any one of the five different sections available. It prints a menu, asks for input, then returns to the main body of the program with the number of the routine to call. PROCcrsr turns the text cursor on and off. PROCend resets the cursor keys, and ends. After using this option to exit, function keys, etc, can be cleared by pressing the CTRL and BREAK keys together (CTRL-BREAK).

PROCpattern exists between lines 600 and 740. Input from the keyboard increments, decrements or randomises a pointer which indicates the ASCII value of current character to be displayed. The pattern is displayed by line 720. Once entered the procedure repeats until ESCAPE or CTRL-BREAK is hit.

PROCshape is found between lines 440 and 590. It draws a cross on the screen by referencing PROCcrsr, then examines the keyboard for characters pressed. If none is pressed in the time limit set at line 490, the cross is moved at random and the process repeats. If, however, a panel is pressed, action is taken by calling one of the graphics procedures, or by incrementing the drawing colour.

In line 980 of PROCshapegame, a shape is chosen at random and the choice routine from line 990 to 1020 draws the shape which mates the random number chosen. The procedure then loops until a keyboard panel is pressed at line 1050 and either hisses if the shape is incorrect (line 1060) or exits the loop (line 1070), buzzes and restarts the procedure (lines 1080, 1090).

PROCdrawsound is similar to PROC pattern in that an index (the variable 'note') to a particular note is incremented, decremented or randomised, then that note is played using the index as the basis of a simple formula (line 880). In line 900 another formula uses this index to position a rectangle on the screen to match the pitch of the note.



PROCsketch is found between lines 280 and 410. PROCcrsr is continually called upon to draw a cross on the screen. If any of the overlay panels are pressed, this is detected by FNkey and the IF...THEN statements between lines 350 and 390 take appropriate action. This procedure is in effect an infinite loop, from which return is only via the CTRL-@ relocated escape key.

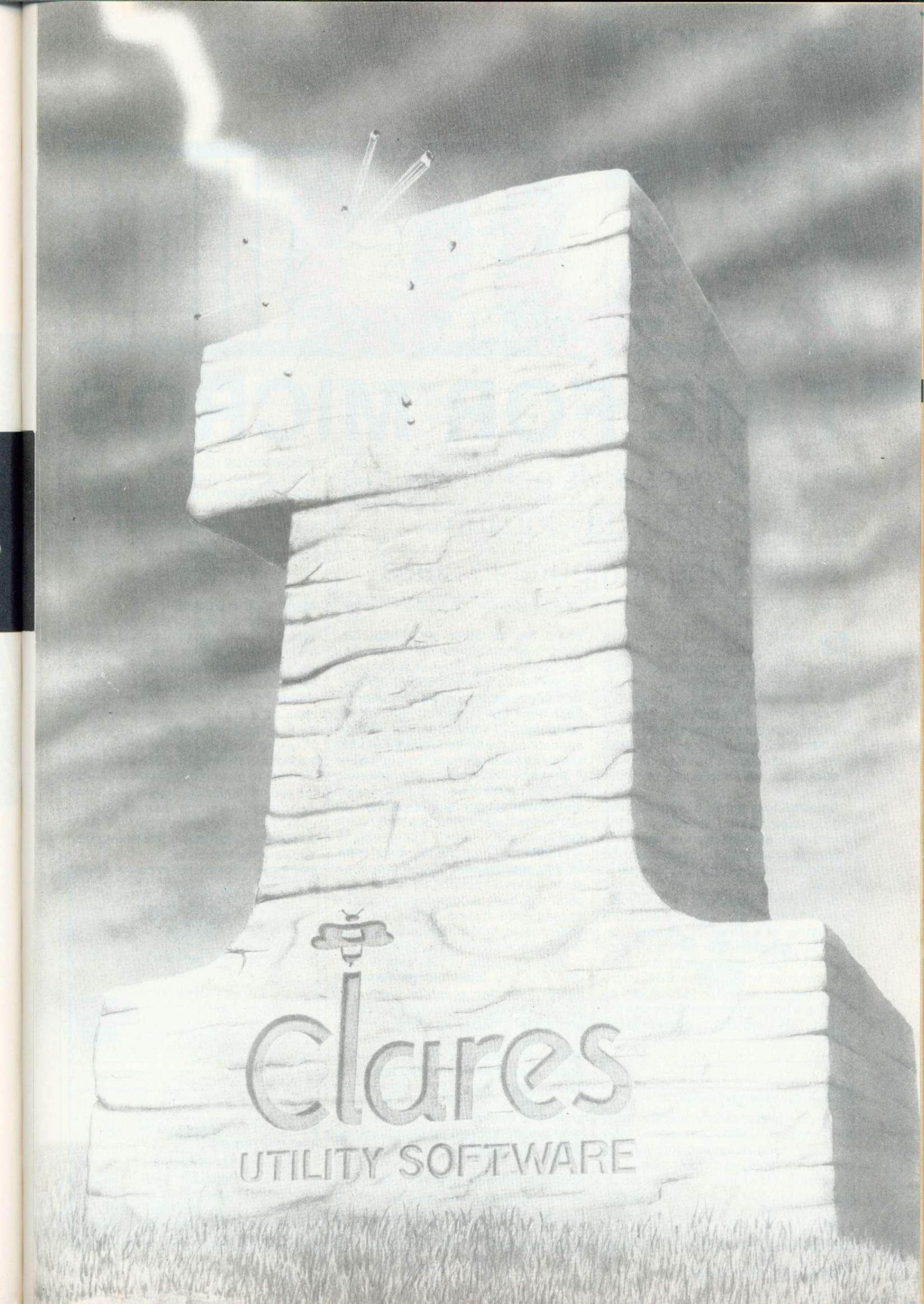
Difficulties brought about by tiny fingers locating the break key can cause concern at first, but provided (as in this application) the stage of the section in use is not important, the problem is reduced to simply working out which section to restart. The approach taken here would not be able to maintain variables, or other data, and hence is only one step better than the well-known *KEY10 OLD!MRUN!M technique. Line 40 contains the key to the solution. If the program is run, as it will be at first, K% is set at −1 and the break is set as:

*KEY 10 OLD¦MGOTO50¦M

with apologies to purists for the GOTO (I haven't had a good GOTO in ages).

This means that when BREAK is pressed the program restarts from line 50, hence W% and K% are not initialised. W% is simply the delay in seconds used in the drawshapes procedure, K%, however, is a pointer to the section of the program currently in use. If it is set to −1 the menu is accessed (line 80), otherwise the contents of K% are used to set the variable 'choice' which then selects the section to be executed. When a menu is called, the fact that 'choice' contains something other than 0 indicates that K% must be set to this value, and this is done at line 100. The result is simply that on running or using escape (CTRL-@) to rerun, the menu is invoked. Pressing the break key causes the program to skip the menu and use the section indicated by K%. The effect, to the user, is simply of the screen clearing.


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TIME FOR MICROS

Susan Kingsbury's activity board project brings day-trip fun to using the computer in class

PARENTS and teachers who have recently gained access to a BBC micro will no doubt be looking for imaginative ideas for its use. *Acorn User*'s DIY activity board is a simple but effective device which, in conjunction with the computer, can be used in a variety of ways to foster both creativity and learning. Ideas for its use can come as readily from the children as from the teacher.

This article presents a program (listing 1, page XV) to operate with the board that, after typing into the computer and saving on tape, can be adapted by changing the data lines at the end.

The activity board can be built for a mere £12 or so. It is a simple structure consisting of a sheet of perspex (or, cheaper, hardboard or plywood) supported on four cottonreels. Underneath are switches wired to the BBC micro and these are activated individually by moving a magnetised object across the board. This simple arrangement is the stage on which a variety of scenes can be enacted, with questions and prompts being chanelled through the micro and displayed on its screen.

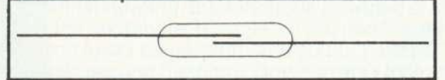


Figure 1. Dry-reed relay switch

Imagine, for example, that on top of the board is placed a sheet of paper showing a groundplan of a zoo (see page 114). Mapped out are eight attractions such as a bear pit, a lion's cage and so on for which toy animals are used. A small wooden toy, which we'll call Fred, with a magnet set into his underside, is moved around the zoo, stopping at places that take his interest. Each time he stops, an appropriate sentence, in double-height letters, appears on the screen. When Fred has seen all he wants to see, the pupil types P on the computer and the whole story of Fred's day at the zoo is displayed on the screen. If you have a printer, the story may be printed out at this stage too.

Fred is taken on his tour by a child, who is encouraged to read each new sentence as it appears. By the end the pupil will have written a story just by moving Fred around. In this way, the board could help to teach reading or provide incentive for slow readers.

Once everyone in the class is familiar with the idea, the pupils could devise their own scenario, such as a moon-landing or a race-track, draw the groundplan, make models for the stopping places and change the data lines at the end of the program to give appropriate sentences. Thus they could all be involved over a period of time.

In more detail, this is how the board functions. On the underside there's a reed switch (figure 1) at each stopping place. The reed becomes magnetised when Fred's magnet is positioned above it, the two halves of the reed attracting each other and the switch closing. When Fred moves away, the springiness of the reed opens the switch (figure 2).

Soldered to the ends of the reed switches are wires which make up a cable connected to the BBC machine's user port. When a switch closes, a signal is sent along the cable to the computer and, under the control of the program, the appropriate sentence appears on its screen.

Making the board

You'll need eight dry-reed relay switches (see panel). Look at one of them from the side so that you can see the gap between the halves of the reed. Bring a magnet near to the switch and watch it close. You will hear a click as it does so, and another as it opens when the magnet is moved away.

Taking care not to break the glass at the ends of the switch, bend the wire at its ends to form legs at right angles to the switch (figure 3). Repeat this for all switches, then space them out on the underside of the board and tape them in position with the legs sticking out. You can glue them later.

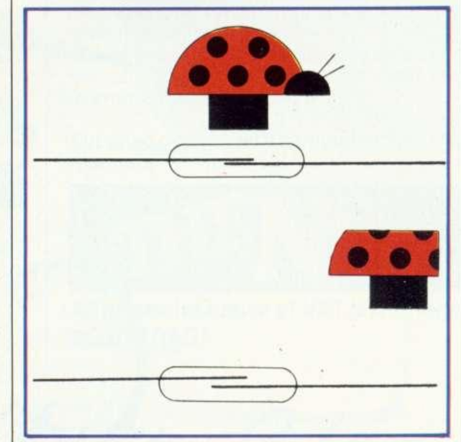


Figure 2. The magnet closes the switch as it passes overhead

The board is linked to the micro via a user port connector and a yard of ribbon cable (see panel). Bring the free end of the cable onto the underside of the board at one of the long edges (the board should measure 30 × 40 cm, the

size of an A3 sheet). Take enough cable to reach the furthest reed switch and separate the wires back to this point (we are not going to use all the wires and the first four, counting the red edge wire as number 1, can be kept together and taped out of the way). Secure the cable to the underside of the board near the long edge using Sellotape or insulating tape (see page 114).

Take wires 5 and 6 and trim them to a length that easily reaches your first switch. Strip about 2 cm of plastic from the ends of the wires. Wind the end of wire 5 around one leg of the switch and wire 6 round the other leg. Solder firmly in place. Label this switch 1.

Taking the rest of the wires in pairs – 7 and 8, 9 and 10 and so on – solder them to each of the reed switches, numbering the switches as you go, up to switch 8. The position of the switches is not important – the numbering merely enables you to relate each switch to its appropriate sentence. Tape any loose wires firmly to the board and make sure the cable is secured near the edge.

You'll find it helpful to stick a small label on the upper side of the board above each switch to mark its position, which you can check by moving Fred around and listening for the click of the switches closing. Stick four cotton reels on the corners to support the board, turn it the right way up – and away we go!

To check that all is working, plug the connector into the user port on the underside of the BBC machine, type in this little program:

```
10 PRINT 255-(?65120)
20 GOTO 10
```

and run it. At first you'll see a column of zeros on the screen. Move Fred over switch 1 and the zeros should change to ones. Test all switches 1 to 8 and you should see the numbers 1, 2, 4, 8, 16, 32, 64 and 128. If necessary, adjust the positons of the switches to make sure they close when Fred is above them, and check your soldering.

Draw your zoo plan with the stopping places corresponding exactly to your switch positions. Add your toy animals, type in the *Zoo* program and Fred is ready to make his visit.

The program

The program begins with a note for the teacher and asks whether you wish to use the printer. Type Yes or No and press the space bar to continue. As Fred is moved around the zoo the sentence on the screen should correspond with the place he is visiting. Type P to see your story on the screen and, if required, to have it printed out.

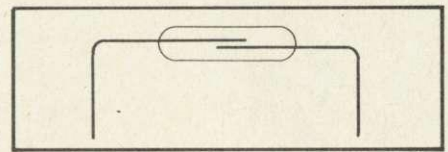


Figure 3. Reed switch with wire bent at angles

Listing 2 shows the notes for the teacher as they appear on the screen at the beginning of the program and listing 3 is the printout of Fred's visit to the zoo. He can, of course, pass the stopping places in any order.

To change the sentences to fit a new situation, change the data lines 690 to 770. Type your new title on line 690, followed by your eight new sentences. One important point – because of the double-height letters, the sentence must not be longer than one line. If you want single-height letters type line 500 as follows:

```
500 PRINT B$(J)
```

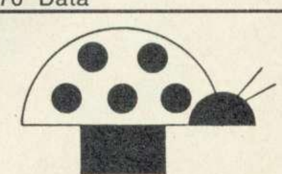
and line 560 as follows:

```
560 PRINT D$(K)
```

and leave out line 570.

PROGRAM ANALYSIS

70,80	Dimension arrays – B$ (number of sentences in data); D$ (possible number of sentences in whole story)
90	Reads title from data
100-120	Reads sentences from data
130	Sets number of places visited to zero
140-280	Prints notes for adult on screen, and registers whether printer is required
290	Waits for space bar to be pressed before continuing
300	Clears screen and prints title in double-height letters
310	Checks whether Fred has set off
320	Clears screen
330–500	Scans user port to see whether Fred has arrived at a new place. If so, prints appropriate sentence on screen. L checks that he has left his previous stopping place and is not just moving about near it
340	Checks whether P has been typed on completion of visit. If so, program jumps to line 540 to display story
510	Adds 1 to number of places visited
520	Stores sentences in array for final display of whole story
530	Returns from sentence subroutine begun at line 400 to check for next place visited
540–580	Prints whole story on screen
590	If print-out not required program ends
600–680	Writes story to printer then program ends
690–770	Data



Odds and ends
4 cotton reels
Toy animals or models made by pupils
Coloured sticky paper
Sheets of A3 paper
Clips for corners
Insulating tape or Sellotape

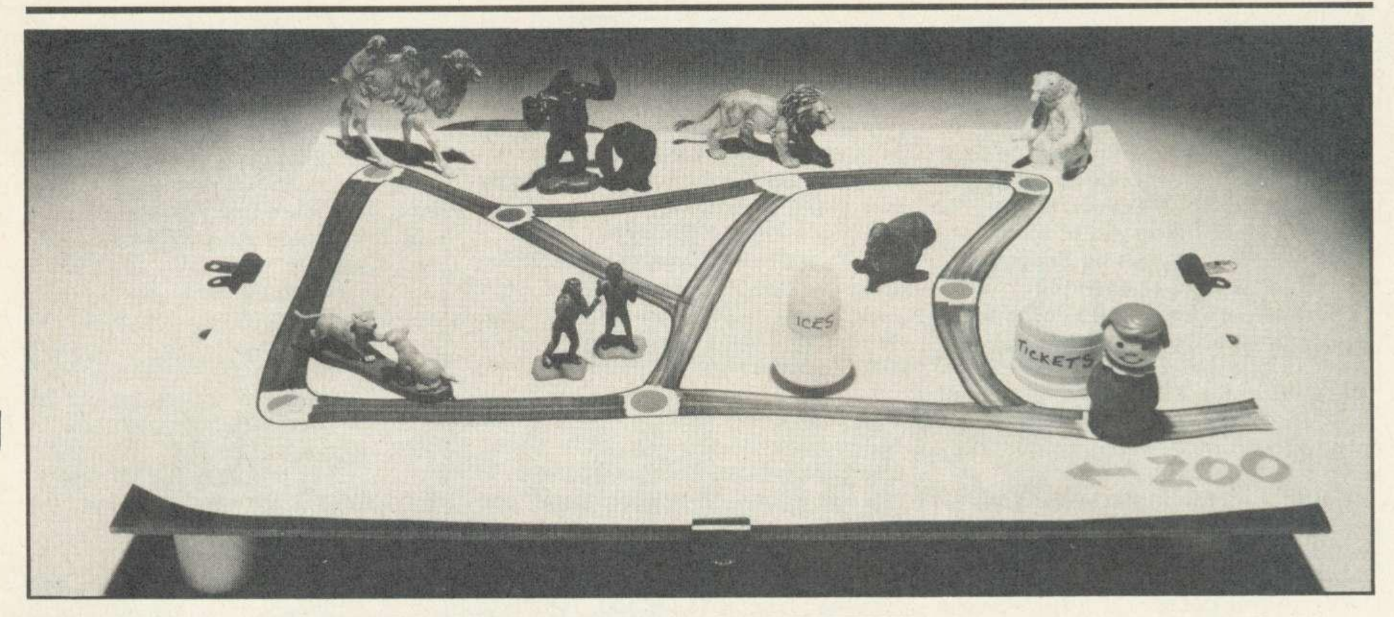
Tools
Soldering iron and solder
Wire-cutters and strippers

Addresses
Radio Spares Components Ltd
PO Box 427
13–17 Epworth Street
London EC2P 2HA

Midwich Computer Company Ltd
Rickinghall House
Hinderclay Road
Rickinghall
Suffolk IP22 1HH

Parts list for Acorn User activity board

1 piece of perspex 30 × 40cm *from* local signwriter (or use plywood or hardboard)	£4.50
8 dry-reed relay switches @40p each *from* Radio Spares Components Ltd Form A, type 7-RSR-A, stock no 338-147	£3.20
1 User Port connector and 36in cable *from* Midwich Computer Company Ltd BBC22	£2.46
1 wooden animal with magnet attached *from* local toyshop	£0.35
Grand total	£10.51



BUILDING THE BOARD

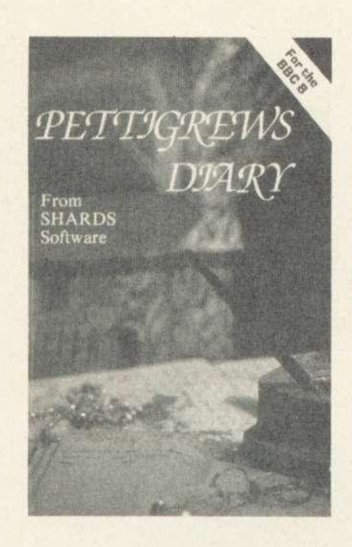
ABOVE: The utility board set up as a zoo with a magnetised figure 'Fred' at the entrance. The order and position of the animals can be changed by varying the order of DATA statements in the listing. Obviously the overlays can be as simple or complicated as you want. All sorts of activities could be developed – theatres, museums, mazes, adventures etc, and the DATA can even include pictures.

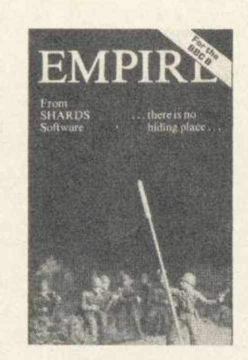
LEFT: Constructing the board. The reed switches are taped to the perspex, as are the wires. Note the cotton reels used as legs! In this picture one of the wires to the user port is being soldered onto a reed switch. Wires 1 to 4 have been trimmed back and are covered by the tape.

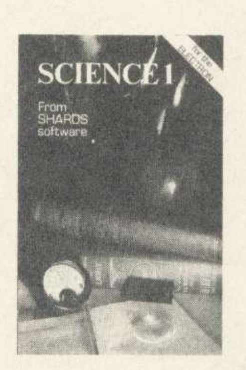
BELOW: The underside of the completed board. Note the position of the user port cable.

For little Acorns Mighty SHARDS Grow









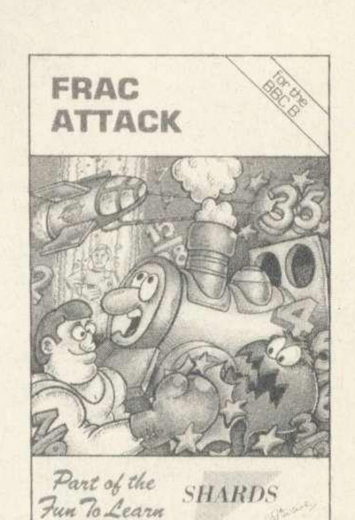
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For the BBC B
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Mystery of Java Star	☐	Laser Letters	☐
Science 1	☐	Frac Attack	☐

Please indicate which version required:-
BBC B ☐ Acorn Electron ☐

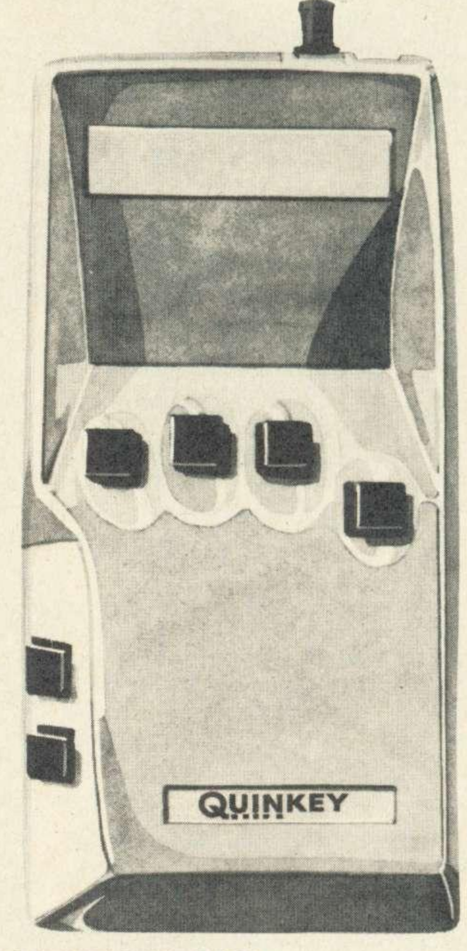
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(Address) ....
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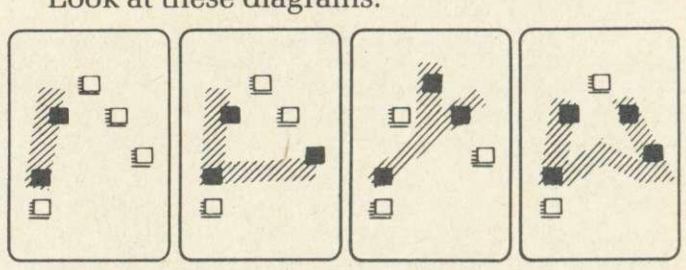
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To write "Y" you use your Thumb, Middle and Ring fingers . . . and so on.

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– PETER WHEELER (in the 'Times Educational Supplement') "a new user can start to touch type after one hour's usage."

– FRANK DALE (BBC Producer – writing in 'Electronic Times') "no other machine is so easy to use, so easy to learn, so generally useful . . ."

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"PROG" enables your BBC to recognise and interpret the signals from the Quinkey keyboard. It combines easily with your application programs enabling you to use Quinkey as a comprehensive alternative keyboard.

"WP" optimises Quinkey to work with word-processing packages "Wordwise," "View" and "Edword" – a perfect text-writing combination.

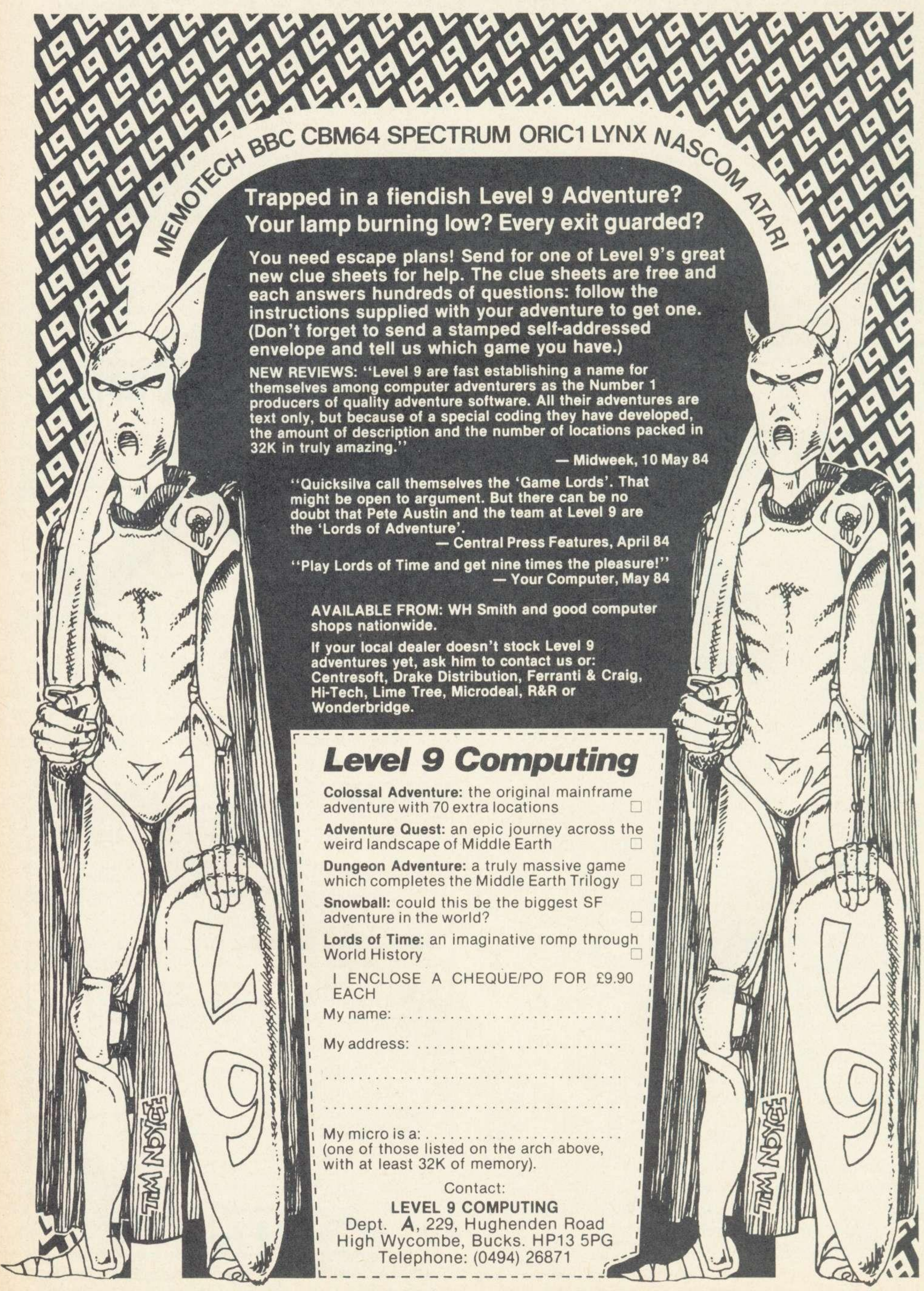
KEYBOARD RANGE.

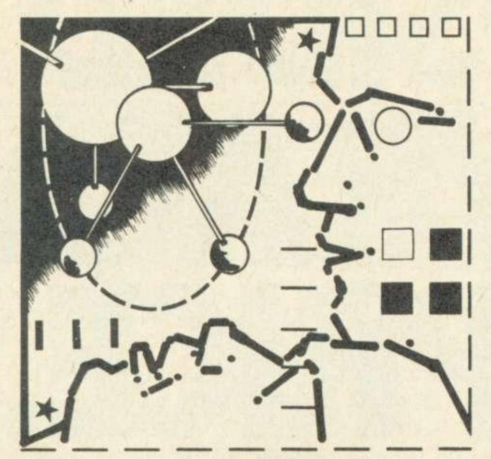
All BBC "B" keyboard inputs generate from the Quinkey, except the hard-wire key, "Break."

TECHNICAL DATA:
Loading length: &605. Running length: &300.
No zero-page locations, all ADC channels.
Interrupt service vector IRQ2V, correctly chained.

TESTED COMPATIBILITY

BBC Model "B"	Acorn
OS 1.2	
BASIC I or BASIC II (unless using INKEY with negative argument)	Acorn
DFS 0.90	Acorn
View A1.4	Acornsoft
Wordwise 1.17	Computer Concepts
Edword	Clwyd Technics


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TIM NOYCE



This month Barry Pickles turns his attention to teletext-style displays, extra codes for Epson printers and two screen dumps

A modular program for teletext display

LISTING 1 lets you create teletext-style displays on the Atom. The functions are set out in a menu and the program has been written in a modular style, so you can add to it. On selecting the CREATE option, you are presented with a blank screen – the screen number appears in the top left. You may move anywhere on the screen, using the cursor controls and return, and type your text wherever. The delete key functions as normal.

Once you are satisfied with the screen, press ESC, followed by any other key, to store the screen. Before storing, the cursor and the first two cells on the screen (where the screen number is) are deleted and they will not appear on the final display. Screens are stored sequentially from #8200 onwards, up to a maximum of ten. CREATE keeps track of the current screen number and attempting to create an eleventh screen will automatically route to the SAVE routine. In EDIT mode, the appropriate screen is displayed and you write/edit it just as you did in creating a screen, pressing ESC and another key to store it back in the correct place in memory. One difference is that the cursor will leave a mark at its initial position – this must be deleted by overwriting it with a space.

The DISPLAY option automatically rotates the selected number of screens and will continue until you press the CTRL key, to return you to the menu. The delay between screens can be altered and is on line 570.

You may save the screens created so far at any time, returning to the menu afterwards, but selecting the QUIT option automatically saves the screens (for safety) before ending.

The machine-code does the work of creating the screen, testing first for ESC (line 40), RETURN (line 50) and, if neither of these are found, jumping to LL2 which echoes the keypress to the screen. The action of removing the cursor and screen number is in lines 810–830.

```
  5REM:       teletext
  6REM: by Barry Pickles
  7REM: (c)ACORN USER 1984
 10DIMLL2;P=#2800;S=1
 15F=0;@=2;P.$21;Z=#B001;[
 20:LL1 JSR#FFE3;RTS
 30:LL2 JSR#FFF4
 40:LL0 JSR#FFE3;CMP@27
 50      BEQ LL1;CMP@13
 60      BNE LL2;JSR#FFED
 70      JMP LL0;];P.$6
 80aGOS.d;R=100*C;G.R
100 REM:LOAD TEXT
110 *LOAD"SCREENS"
120 G.a
200eREM:SAVE TEXT
210 E=#8200+(512*S)
220 *SAVE"SCREENS" 8200 E
230 IFF;@=8;END
240 G.a
300 REM: CREATE SCREEN
310 P.$12,S
320 LI.LL0;GOS.b
330 S=S+1;IFS>10;F=1;G.e
340 G.a
400 REM: EDIT SCREEN
410 IN."SCREEN NO."Q
420 E=#8000+(512*Q)
430 F.N=#8000 TO #8200 S.4
440 !N=!E;E=E+4;N.;LI.LL0
450 C=?#DF*256+?#DE+?#E0
460 ?C=32;E=#8000+(512*Q)
470 F.N=#8000 TO #8200 S.4
480 !E=!N;E=E+4;N.
490 G.a
500 REM: ROTATING DISPLAY
510 P.$12;IN."SCREENS 1 TO"Q
520cM=M+1;IFM=100;G.a
530 IFM>Q;M=1
540 E=#8000+(512*M)
550 F.N=#8000 TO #8200 S.4
560 !N=!E;E=E+4;N.N
570 F.D=1 TO 1000;WAIT
580 IF ?Z&#40=0;D=1201;M=99
590 N.D;G.c
600 REM: END
610 F=1;G.e
700dREM:MENU
710 P.$12"              menu"''
720 P." 1 - LOAD TAPE FILE"'
730 P." 2 - SAVE TAPE FILE"'
740 P." 3 - CREATE SCREEN "'
750 P." 4 - EDIT SCREEN"'
760 P." 5 - DISPLAY"'
770 P." 6 - QUIT"''
780 IN."SELECT OPTION"C
790 IFC<1 ORC>6;G.d
795 M=0;R.
800bREM: STORE SCREEN
810 C=?#DF*256+?#DE+?#E0
820 ?C=32;E=#8000+(512*S)
830 ?#8001=32;?#8002=32
840 F.N=#8000 TO #8200 S.4
850 !E=!N;E=E+4;N.
860 R.
```

Listing 1. Requires 1.5k text memory and at least 1k screen RAM

Code comments

FOLLOWING the list of undocumented 6502 op-codes in the June issue, several useful comments have been received. The first, from M Niman of Manchester points out that the code #9C performs the action: STZ absolute, X and not as stated in the article. Quite right, Mr Niman, I stand corrected! Mr Niman also asks me to point out that there are several versions of the 6502 and the undocumented codes are not necessarily compatible between each version. This may indeed be so and the same warning applies to all undocumented code. However, the codes were tested on the Rockwell and Synertek versions and found compatible.

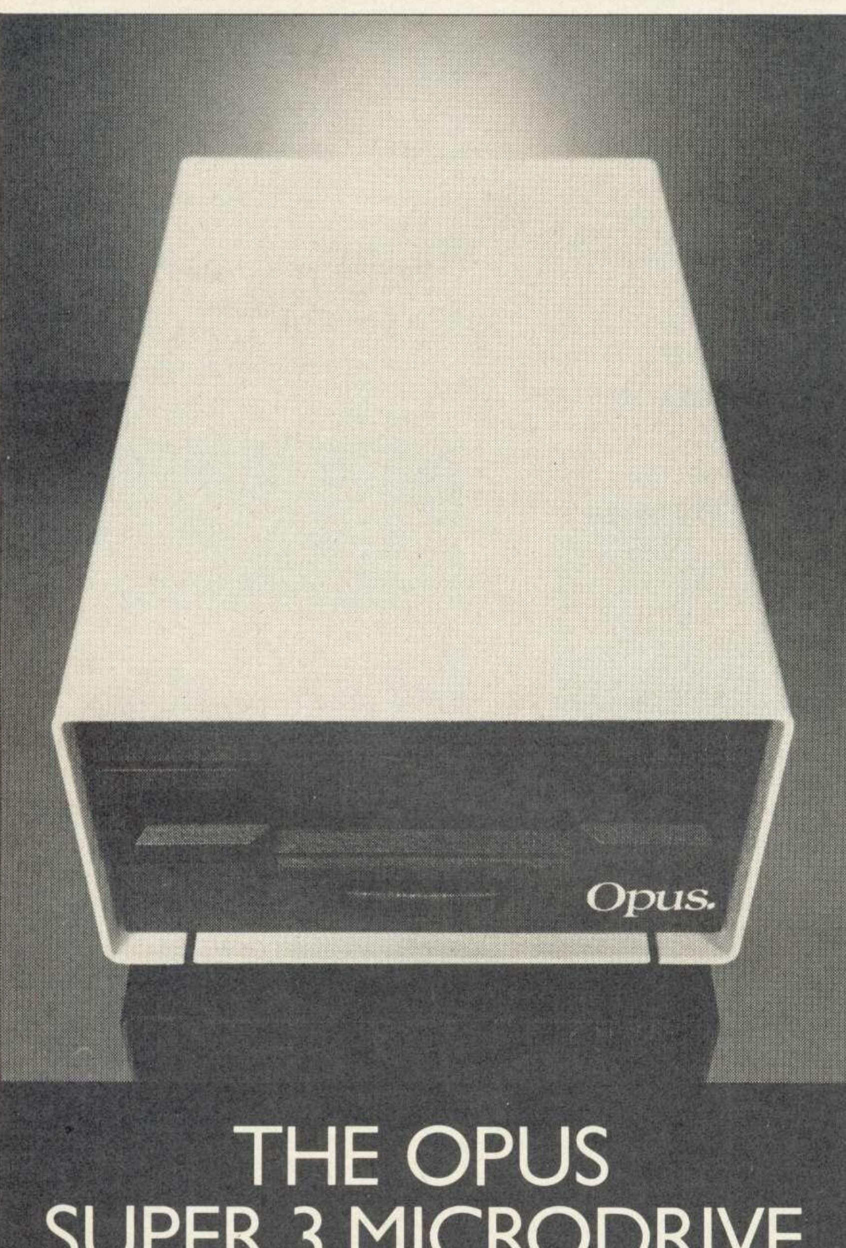
It should be noted that the codes are *not* compatible with the extended instruction set of the new CMOS 65C02 (the full instruction set details of this chip can be found in the October 1983 issue of *Elektor*). Finally, Mr Niman mentions the new chip from Western Digital, the 65SC816. This is the 8/16 bit version of the 6502 and is said to be fully pin-compatible.

Geoff Smith of Worcester Park suggests that op-code #AB loads the same immediate operand into A and X, setting bit 4 to 0. I've tested this a number of times, and the arithmetic results are not consistent. However, bit 4 is always set to 0, so perhaps someone will have a use for this code.

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2 9JH.

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Searching for compatible drive

MR A SULEIMAN of Wolverhampton asks which drives are compatible with the Atom. Well, the standard Atom DOS is configured for the Olivetti/Shugart-type drive, but it can, on request, be customised for the Tandon drives. I'm not sure about the new 3in drives, but I suspect they are also compatible, since they work on the Beeb.

You will need the Atom DOS and some extra memory, and the complete interface (needing only a drive unit) is available from Control Universal in Cambridge. However, I hear on the grapevine that CU is scrapping the original interface in favour of a double-density version, so have a word with them before buying a drive.

Finding the interpreter

RICHARD GATES of East Dereham wrote to tell me of a strange result obtained when he accidentally typed in P.CHR$(0) in direct mode. What he got was 94, which was the number of last error he produced.

After some experimenting, he found that P.CHA was equivalent to P.?A. However, he admitted defeat when trying P.CHA$(0)?I.

What Mr Gates discovered is the way that the interpreter works. The manual, you remember, tells you that, for most cases, spaces and brackets are not significant.

The interpreter works along a line from the left, until it encounters either an error or something it can interpret. As soon as it finds something meaningful, it stops, stores its position, and interprets the command/function, then carries on from where it left off. Now, you recall that a letter can be a variable or a pointer to an address, so, in the case of P.CHR$(0), the interpreter correctly interprets P., then moves on. The next thing it finds is CHR, which is a valid function, meaning the first character of $R. Now it comes to $(0). There was no comma separating the two, but the interpreter doesn't need one and $(0) is again a valid function. Since location 0 holds the last error number, that is what is printed out. In the latter case, the interpreter reads the function as: P.CHA;P.$(0?I).

So there you are, Mr Gates. No bugs, just the interpreter not giving up unless it has to.

```
 10 REM PRINTER CODES
 20 ?40900=0
 30 IN."STORE CODE AT "Q
 40 DIM  LL6;F.Z=0 TO 6;LLZ=£2000;N.Z;F.Z=0TO1;P=Q
 50 P.$21
 60[
 70 LDA@ LL0%256;STA£208;LDA@(LL0/256);STA£209
 80 LDX@£60;STX£E7;JSR£AC4B
 90 LDA@£20;STA£21C;LDA@£7F
100 STA£21D;LDA@£AC;STA£21E;LDA@£A2;STA£21F;LDA@£4;STA£220
110 LDA@£20;STA£221;LDA@£83
120 STA£222;LDA@£FB;STA£223;LDA@£60;STA£224
130 JMP£A03C
140:LL0 CMP@£2;BEQP+5;JMP£ACCE
150 LDA@LL1%256;STA£208;LDA@LL0/256;STA£209;LDA@2;JMP£ACCE
160:LL1 CMP@£3;BNEP+£11
170 LDA@LL0%256;STA£208;LDA@LL0/256;STA£209;LDA@3;JMP£ACCE
180 CMP@£7E
190 BEQP+5;JMP£ACCE
200 LDA@(LL2%256);STA£208;LDA@(LL2/256);STA£209;RTS
210:LL2 STXLL3+86;LDX@£FF
220 INX;CMPLL3,X;BNEP-4
230 LDALL3+16,X;TAX;DEX
240 INX;LDALL3+32,X;BMIP+8
250 JSR£FEFB
260 JMPP-£9
270 LDA@(LL1%256);STA£208;LDA@(LL1/256);STA£209
280 LDXLL3+86;RTS;:LL3;]
290 N.Z
300 A=LL3;   !A=£64636261;A=A+4;!A=£68676665;A=A+4;!A=£6C6B6A69
310 A=A+4;!A=£706F6E6D
320A=LL3+16;!A=£0C080400;A=A+4;!A=£19161310;A=A+4
330 !A=£25221F1C;A=A+4;!A=£322F2B28
340A=LL3+32;!A=£80012D1B;A=A+4;!A=£80002D1B
350 A=A+4;!A=£8001531B;A=A+4;!A=£8000531B;A=A+4
360 !A=£1B80541B;A=A+4;!A=£461B8045;A=A+4
370 !A=£80471B80;A=A+4;!A=£1B80481B;A=A+4;!A=£141B800E
380 A=A+4;!A=£800F1B80;A=A+4;!A=£1B80121B;A=A+4
390 !A=£1B801241;A=A+4;!A=£401B8032;A=A+4;?A=£80
400 P.$6
410 ?£20A=£1C;?£20B=£02
415 LINK Q
420 E.
```

Listing 2. P McArdle's Wordpack patch



Wordpack patching to provide extra codes for Epson printers

LISTING 2 comes from P McArdle of Galway and is a patch for *Wordpack* users, giving extra codes for Epson printer functions. Unlike other *Wordpack* codes, these may be used anywhere in a line, but they will be counted as characters for justification purposes. The codes are held in a look-up table, beginning on line 300 and they may be altered to suit other printers. Used with *Wordpack*, you will need extra RAM to store the assembled code. The listing assumes RAM from #2000 and the vector set at the end of line 100 and the start of line 110 should point to Q+4. Those who use the new Bearsoft *Editor* may assemble the code at #2800 and must also alter the JMP on line 130 to #A01B.

The codes are each output using two characters. The only special character which may not be used for any other purpose in the text is ˜ [shift ˆ]. This character is followed by a code letter:

- ˜a underline
- ˜b cancel underline
- ˜c subscript
- ˜d superscript
- ˜e cancel super/sub-script
- ˜f emphasised print
- ˜g cancel emphasised print
- ˜h double print
- ˜i cancel double print
- ˜j big print return cancels
- ˜k cancel big print
- ˜l small print
- ˜m cancel small print
- ˜n double line spacing
- ˜o normal line spacing
- ˜p initialise printer

The program has the following properties. The code it compiles occupies less than 256 bytes. This is placed at the address requested at the start of the program. If RAM is available below #2800 then use it; it not, be careful not to overwrite it. Line 20 is a ROM switch command: if you need one put it here. The program debounces the Atom's keyboard. If you do not want this, delete lines 90 to 120 and line 410.

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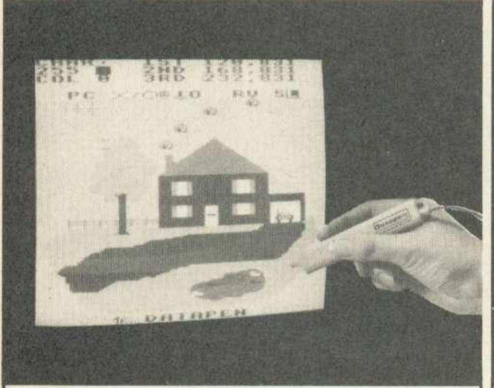
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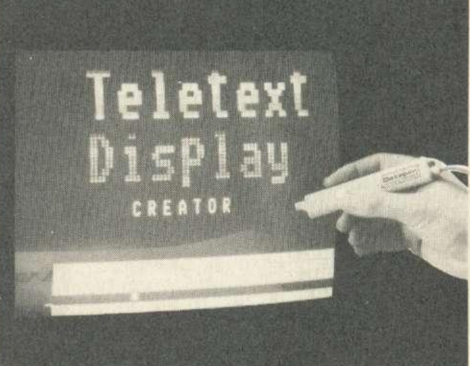
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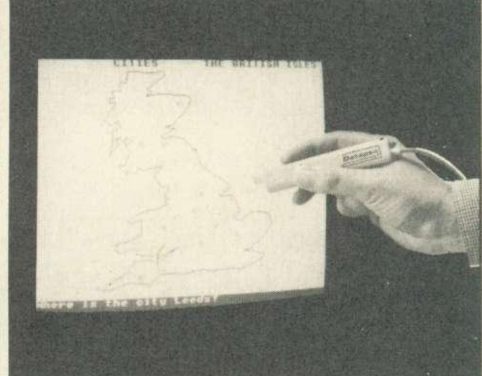




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Star modifications for screen dump

A SCREEN dump for the Epson MX80 by Chris Shepherd of London is given in listing 3. It is enabled by LINK #xxxx, where xxxx is the start of the machine-code. It can be modified for the Star range of printers by deleting line 570, then rewriting the following lines:

```
310 LDA@76; JSR#FEFB
610 LDA@140: JSR#FEFB
```

```
100 REM GRAPHICS DUMP
110 REM C.A.SHEPHERD
120 REM
130 P.$12;DIMLL10
140 P.'"ASSEMBLE TO"';
IN."(E.G. #3B00) "Q
150 P.'"LIST"';IN."
(1=YES, 0=NO) "L
160F.I=0TO10;LLI=Q;N.
170P.$21
180F.I=0TO1
190P=Q
200[
210:LL0 LDA @2
220JSR#FEFB
230LDA@#FF;STA #8A
240LDA@#7F;STA #81
250LDA@#E0;STA #80
260LDA@0;STA #8D
270LDX@#3F;STX #8B
280:LL1 LDY@0
290STY#89
300LDA@27;JSR #FEFB
310LDA@75;JSR #FEFB
320LDA@00;JSR #FEFB
330LDA@#01;JSR #FEFB
340:LL2 LDX @7
350 CLC
360:LL3 LDA (#80),Y
370STA #81,X
380TYA
390ADC@#20
400TAY
410DEX
420BNE LL3
430LDY@8
440:LL4 LDX@7
450:LL5 ASL #81,X
460ROL A
470DEX;BNE LL5
480AND #8B
490AND #8A
500JSR #FF10
510 DEY
520BNE LL4
530INC#89
540LDY#89
550CPY@32
560BNE LL2
570LDA@#FF;STA #8B
580LDA@27;JSR#FEFB
590LDA@74;JSR#FEFB
600LDA@20;JSR#FEFB
610LDA@224
620CLC
630ADC #80;STA#80;LDA@0
640ADC #81;STA #81
650INC#8D
660LDA#8D
670CMP@27
680BMI LL6
690BNE LL7
700LDA@#70
710STA#8A
720:LL6 JMP LL1
730:LL7 LDA @3;JSR #FEFB
740RTS
750]
760IFL P.$6
770N.
780@=4
790P.$6'"OCCUPIES #"&Q" TO #"&P'
800 E.
810 REM
820 REM A GRAPHICS DUMP IS
830 REM OBTAINED BY INSERTING
840 REM THE COMMAND, LINK#XXXX
850 REM WHERE XXXX IS THE
860 REM ASSEMBLED CODE START
870 REM ADDRESS IN HEX.
```

Listing 3. Chris Shepherd's program for Epson printers

```
 90REM PROGRAM TO PRINT THE £ SIGN ON THE AP100A.
100DIMLL1;F.I=1TO2;P=#3D0
110[;PHA;LDA@#FF;STA#B802;LDA#B80B;ORA@2;STA#B80B
120PLA;PHA;CMP@#5C;BNE LL0;PLA;LDA@#B9;PHA
130:LL0 AND@#80;BEQ LL1;LDA@1
140:LL1 STA#B800;PLA;JMP#FE52;]
150N.I;END
```

Listing 4. Curing an almost universal problem

```
 995REM:Subroutine for
 996REM:Daisystep 2000
 997REM:screen dump on
 998REM:the Acorn Atom
 999REM:©B.Pickles - 1984
1000dP.$21$2;REM:screen off
1009REM: horizontal spacing
1010P.$27$31;A=4;LI.#FF10
1019REM: vertical spacing
1020P.$27$30;A=2;LI.#FF10
1030P.$27$78;V=#2800
1039REM: bit mask
1040!V=#10204080;V!4=#1020408
1050F.Y=191TO0S.-1
1060F.X=0TO255
1069REM: convert x/y to address
1070P=X/8+(191-Y)*32+#8000
1079REM: test point at x/y
1080Q=(?P&(V?(X&7))<>0)
1090IFQ;P.".";G.b;REM: set
1100P." ";REM: not set
1110bN.;P.';N.
1119REM: back to normal
1120P.$27$26$73$3$6;R.
```

Listing 5. Daisystep 2000 screen dump

Programming for printing the pound



NEXT is a short routine (listing 4) from Abe Ellis of Chelmsford. This solves the almost universal complaint that printers insist on printing a # sign, instead of the £ sign. The program is quite simple and the listing to assemble the code into spare space at #3D0 is shown. Before use it is necessary to change the vector as follows:

?#209 = 3;?#208 = #D0

The keyboard 'backslash' (#5C) is used for the £ sign, but this can be any keyboard character.

So the printer can accept an eight-bit word, bit 7 must be connected to the Atom printer plug, pin 9. This is done using port B, bit 0 of the 6522. Accordingly, pin 10 of IC1 is wired to PL5 pin 9.

Line 110 of the program initialises port B of the 6522. Line 120 looks for the #5C code and changes it to #B9, which is the code used by the AP100A for '£'. Line 130 checks if the msb of the character is a '1' which includes all other special characters in the AP100A. Line 140 sets port B, bit 0 to a '0' or a '1' as required.

The Basic print statement can now be used normally. The symbol which appears on the screen is a graphics symbol but this need not concern us. It must be remembered that if break is pressed the #208/#209 vector must be re-entered as #3D0.

Unfortunately, when the Acornsoft Wordprocessor ROM is entered, the printer vector is re-initialised and there is no way of breaking into the program to correct this. However, I have overcome this as follows.

Assemble the program normally, then enter the wordprocessor and complete all editing. To print out the text it is necessary to enter Basic using 'Q'. Now the vector can be corrected to #3D0 as before, followed by LINK #ACF7 when the printer will print the text.

Problems with the Daisystep

LISTING 5 provides screen dump programs for the Daisystep 2000 printer.

Next month's Atom Forum will contain screen dumps for the Seikosha and the Centronics 737/739. This should now cover all the popular makes.

COMPUTER CONCEPTS

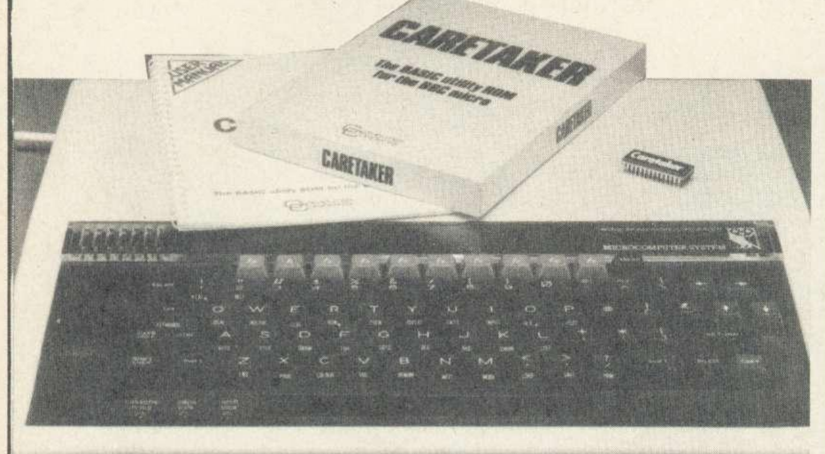
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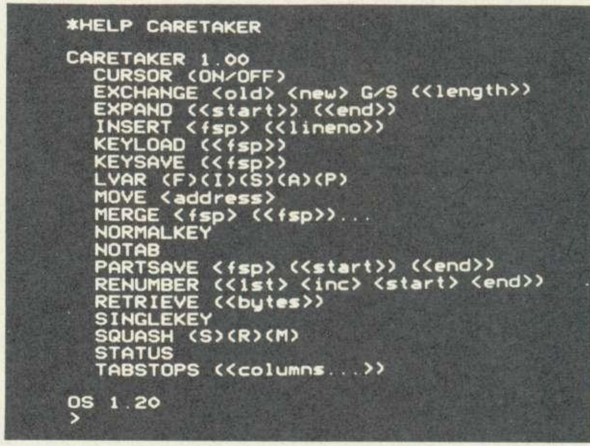
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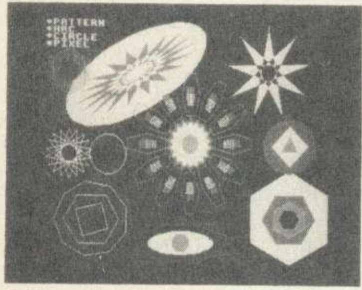


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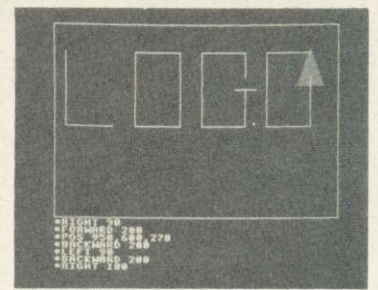


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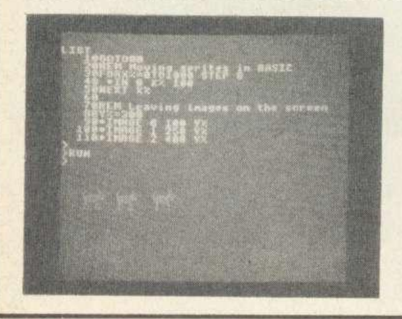


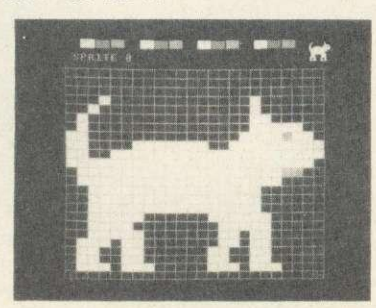


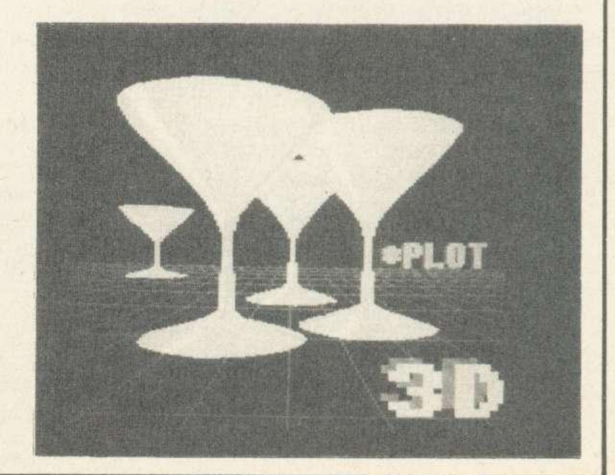


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AVOIDING INVALID DATA ENTRY. 1

Most coders have their own system for error-trapping. Vincent Fojut examines a common INPUT problem which can sometimes trap the unwary user

WHEN writing programs, especially for use by others, it is important to cater for invalid data entry, whether deliberate or accidental. The practice is often referred to, somewhat unkindly, as 'idiot-proofing' or 'mug-trapping'. Most coders will have a few routines to detect the more obvious errors, but it is often difficult to foresee all possible causes of 'misinterpretation'. A perfect example is that the operation of AtomBasic's INPUT command can itself trap the unwary.

On the Atom, 'INPUT' works like 'INPUT LINE . . .' on the BBC/Electron. That is, anything entered in response to INPUT's prompt, including leading spaces, is passed to Basic for evaluation. With numeric data entry this is not a problem, since Atom's expression evaluator will skip leading spaces until a suitable number, variable or expression is encountered. However, when inputting strings, confusion can arise.

Try running the following simple program on your Atom:

```
10 R = #3000
20 INPUT "AGAIN (YES/NO)" $R
30 IF $R = "YES" THEN RUN
40 END
```

Enter 'YES' immediately after the prompt and the program will run again. The second time, enter a couple of spaces before typing in 'YES', and see what happens. On a Beeb or Electron, the program would continue to run. However, on the Atom it stops.

In other words, INPUT on the BBC (without the LINE option) automatically left-justifies any string entered – that is, it removes leading spaces. Atom's INPUT does not do this, which can be disconcerting for the inexperienced user, who may be hard-pressed to see any fault in the apparently correct data entered. Fortunately, it is a simple matter to implement the required left-justification facility. Both Basic and machine-code solutions are provided herewith.

Program 1 shows a few simple Basic subroutine variations to eliminate leading spaces. In all cases, variable X points to the string to be left-justified, and should be set up before the subroutine call.

Version (a), written 'in full' for clarity, works in the following way:

If the first character in the string is not a space, then the string must already be left-justified, in which case the routine exits immediately. Otherwise, each character of the string is examined in turn, until a non-space char. is found. Once detected, the string starting from the first non-space char. is moved down to the string's original starting address. In this way, unwanted spaces are eradicated.

Version (b) and (c) employ subtly different coding from the original, in an attempt to make the routine as compact as possible. Since version (b) does not use an IF statement, the whole code can be fitted on one line. The only processing overhead is that even if the string is already left-justified, the 'string-move' code is still executed, ie, it 'moves' to where it already is!

In (c), the code drops through to the second line (a RETURN statement) if the first character in the string is not a space. If it is, the whole string (starting at the original address +1) is repeatedly shunted one byte downwards, until the first char. is not a space. This is obviously slower if there are many leading spaces. For example, 10 spaces means that the entire string is moved 10 times. On the plus side, this variant is the shortest of the three, and uses only one Basic variable, not two.

To see the routines in practice, modify the earlier program thus:

```
10 R = #3000
20 INPUT "AGAIN (YES/NO)" $R
30 X = R; REM X POINTS TO STRING
   "R"
40 GOSUB J; REM CALL
   LEFT-JUSTIFIER
50 IF $R = "YES" THEN RUN
60 END
```

You should now be able to reply to the prompt either with or without leading spaces.

Providing the correct response is entered (ie, 'YES') the program will always re-run.

Program 2 is a functionally similar program written in machine-code. As before, the Basic variable X is made to point to the string to be analysed, before calling the routine with the LINK command. To try it out, assemble the machine-code at, say #2800 and change line 40 in the previous program example so that 'GOSUB j' becomes 'LINK #2800'.

The program uses two zero-page locations as a string pointer, and once these are set up, the processing is as per version (a) of the Basic routines.

It should be noted that these programs are not limited to use with Atom's INPUT routine. They can be employed in any situation where strings need left-justifying – for example, formatting data in tabular form.

Of course, there's a good deal more to error-trapping than one could cover adequately in an article. But the routines outlined here go one more step towards eliminating the unexpected, and make robust, reliable code a little more easily attainable. If your strings no longer match on input, you can rest assured that it isn't due to spurious spaces.

For complete listings see yellow pages, page xvi.

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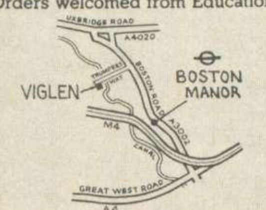
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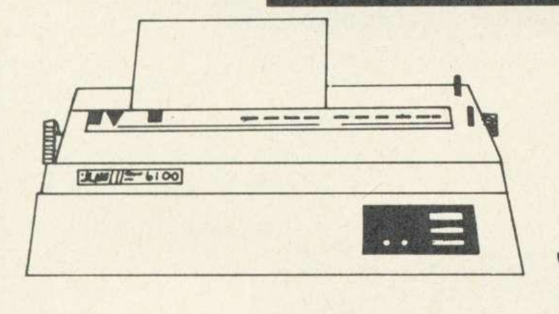
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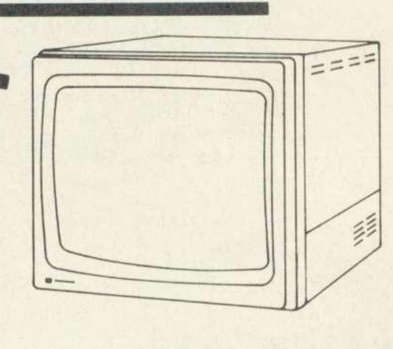
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B = BBC E = Electron Prices in brackets are for disc version

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Hulk (Adventure International)
Fruity Fred (Softspot)

Compiled by RAM/Computer

THE pace for this month's chart is being set by Amcom's *Fortress* which has cannoned *Snooker* from Visions into second spot. No new Top Ten entries again this month though Superior's *Battle Tank* has blasted its way into number 12. Another new entry is *Mr Wimpey* from Ocean, while *Pengwyn* and *Eagle's Wing* have flown into the number 17 and 16 spots respectively.

***Snapper* after two years of chart fame is tottering on the edge of the chart at number 20. Will it stay or be gobbled up by a new entry?**

The highest chart climber this month is Evil Knievel's protégé *Daredevil Denis* who rides up ten places to number 6.

Bubbling under from the last issue still are *Aviator, Hulk* (we still haven't seen a copy), *Jet Power Jack* and Acornsoft's new earthmover *JCB Digger*, reviewed in July and June respectively.

SOFT OPTIONS

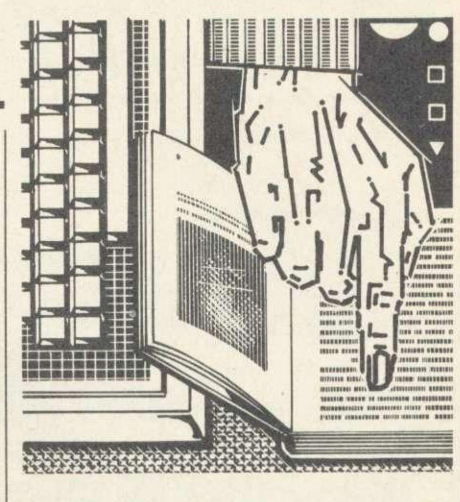
RE-SITTING English literature O Level again this Christmas? Then you might be interested in three new pieces of study software for the Beeb and Elk: Shakespeare's Macbeth, Romeo and Juliet and The Merchant of Venice. Each allows you to follow your own line of questioning, delving into the lover's secrets (is this *Dallas* in disguise?) or who killed who (yes it is!). The programs prompt you in the correct line of questioning and full act and scene references are provided.

Gsoft is providing *Multibase*, a text editor and a key definer/character generator from its 18 Melbourne Road, London, E17 address. *Multibase* allows you to use the one main program to create and manipulate a variety of multi files to be used for phone numbers, indexing etc, which can be dumped to a printer or saved on tape or disc. *Text Editor* enables you to write text to the screen which can be edited and printed as required. *Key Definer* sets up each of the function keys with a number of useful utilities to complement your programming techniques, while *Character Definer* is another in the increasingly large range of VDU23 editors.

For those who can't spell, *Spellwise* is the third checking programs for use with Computer Concept's *Wordwise*. With 6000 words in its vocabulary it should cover most of your needs! Contact Dataware, Freepost, Swindon SN3 4BR for more details (write carefully!).

If you've read all the assembly language books around, the *Complete Machine Code Tutor* from New Generation Software is a cassette-based machine code tuition package. The two cassettes contain 27 lessons aimed at trial and error learning. New Generation is at The Bookands, 15 Sunnybank, Lyncombe Vale, Bath, BA2 4NA.

Apart from all that, things are fairly quiet on the new software front, with many software houses saving up their fares for the Acorn User Exhibition.



BBC HARDWARE FACTS

UNDER ONE COVER

'A Hardware Guide for the BBC Microcomputer', Wise-Owl Publications, Hull Innovation Centre, Guildhall Road, Hull, HU1 1HJ, £11.95 (inc VAT) plus £1.50 p&p

This book has 253 A4 size pages, which sounds a lot, but you should be aware that 136 pages are simply re-prints of manufacturers' IC data sheets. The remaining 117 pages are reproduced from a computer printout done on a daisywheel printer, but using a fairly large text format. This means that there are about 400–500 words per page. The following summary gives an idea of the contents of each chapter, plus some indication of its length.

Chapter 1 (five pages) is a general introduction giving an overview of the BBC microcomputer system as a whole. The aim of the book, it says, is to give 'a detailed understanding of the internal workings of the BBC micro'.

Chapter 2 (six pages) is entitled 'Attitudes to work and disciplines required'. It conveys some general ideas of the technical skills needed if you want to start playing with the hardware: how to handle ICs that might be damaged by static, and information on how to solder, de-solder and de-flux PCBs.

Chapter 3 (23 pages), which contains a 'complete description of the circuitry', is where the real meat of the book begins. This number of pages may seem ample space to describe the circuit, but it is an extremely complex machine, and in places the description is a little superficial. Also, the last six pages of the chapter deal with the use and applications of the 1MHz bus.

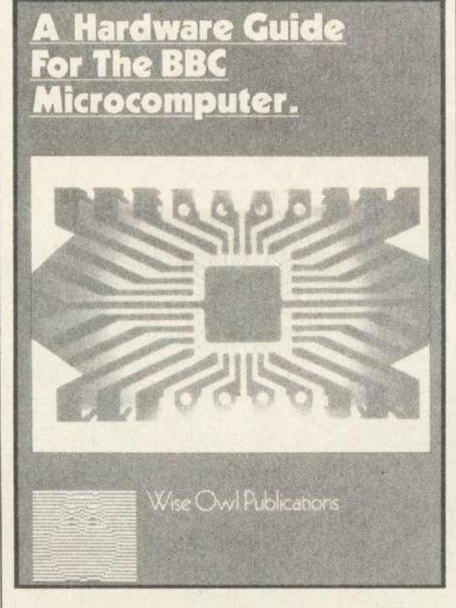
Chapter 4 (21 pages) is a very full survey of the link selections. The first four pages explain how to remove the main PCB and re-assemble it and give a warning about breaking warranty by doing soldering on the board. I was interested to see that the authors have been unable to find out what link S7 really does. While writing the new service manual I spent some time asking engineers at Acorn what it was for, and no-one there knew either. (Anyone got any ideas?)

There is one notable omission, presumably accidental. When talking about link S23 the reader is referred to the data sheet for the 88LS120 (RS423 driver IC), which it says is included in the book – unfortunately it's not there.

Chapter 5 contains 34 pages of detailed information about how to upgrade the machine from A to B, how to add the disc, Econet and speech interfaces, and some indication about adding second processors.

An interlude between chapters 5 and 6 consists of four full-page photographs of the computer indicating the positions of various ICs, fixing screws and so on.

Chapter 6, 'Hints, tips and modifications' (13 pages) contains many ideas which, on the authors' own admission, have been published elsewhere. Nevertheless, it makes a useful compilation. The chapter contains a section about the analogue port which has a number of mistakes. The pin numbering of the plug is incorrect in two of the diagrams, and it gives a method of supposed over-voltage protection which, in certain circumstances, would not only fail to protect the chip but would blow the protecting devices – LEDs. This is because they have forgotten to



put current limiting resistors in series with each input – 1000 ohms would do.

There are one or two other omissions, apart from the lack of the 88LS120 data sheet. The first is that, except for the cassette interface, no circuit diagram is provided. This reduces the value of the circuit description. Acorn would not give permission for Wise-Owl Publications to reproduce the diagram (despite the fact that it had already been released to the general public in the *Advanced User Guide*). The other omission is that although the preface refers to 'system fault-finding', there seems to be no more than a passing reference to this in the text.

There's quite a lot of useful information in this book, and generally speaking it is of a good technical standard. It is also helpful to have all the datasheets in the one document, but the real question is whether or not it is worth the money (£13.45 inc p&p). Owners of the *Advanced User Guide* may feel it is not since they already have a link selection survey and a limited description of the hardware. In general though this is a useful text, if a little over-priced. **Paul Beverley**

●Wise-Owl has accepted the criticisms in this review and agreed to correct the various errors which were pointed out to them. **PB**

LITTLE DEPTH

FOR TEACHERS

'BBC Micro in Education', Eric Deeson, Shiva Publishing, £6.50

AS THE BBC is the most important computer in schools, there is a need for a book written specifically for teachers detailing some of the possible classroom applications. Mr Deeson's book is not it.

The first chapter asks the inevitable question 'What is a computer?' and in a couple of pages swiftly disposes of bytes, CPUs, ROMs, and RAMs – all never to be mentioned again, so why bother in the first place? It also features a feeble drawing of a BBC, monitor and tape recorder sitting on a desk-top – in case you didn't know what such things looked like.

Next we get a Basic programming tutorial from first principles and I mean first principles – for example, 'Press RETURN after each line'. Very laudable, but a bit out of place in this book. Then comes a section on applications – Prestel, wordprocessing and the like, which again is disposed of very quickly.

And so the book continues, jumping from one subject to another and not really covering anything in sufficient depth. The best chapter is the one on graphics, nicely combining program listings with typical applications of computer graphics – CAD, plotters, etc. The worst is on flowcharts and 'top-down programming'.

Throughout the book, Mr Deeson adopts a rather juvenile style: do

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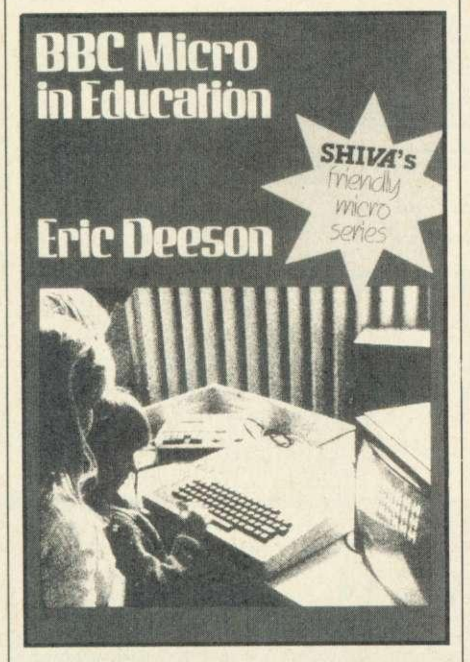
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people actually call the BBC a 'Beebox', and do we really need cartoon drawings of 'bugs' in a book aimed at teachers? In his previous book, *Easy Programming for the BBC Micro*, this device worked well, but here it gets a bit tiresome. In fact, that was a much better book for the newcomer to the BBC, and indeed several chunks from it have found their way into this new book.

The book aims to do too much: teach



the novice Basic programming, cover the many applications of computers, and act as a resource book for teachers. In 170 pages it cannot hope to succeed. Where it would be useful is as a guide to writing educational programs – a very specialised field.

The book contains some useful programs and routines for error-trapping, 'user-friendliness' and easy-to-read instructions, and as such would be invaluable to a teacher who already knows BBC Basic and wants to write his or her own educational software.

Memo to Shiva Publishing: why not call the book *Educational Programming for the BBC Micro* and lose a few of the cartoons? **Geoff Nairn**

BASIC ASSEMBLER

'Assembly Language Programming on the Electron' by John Ferguson & Tony Shaw, Addison-Wesley Publishing, 197 pages, £7.95

JOHN FERGUSON and Tony Shaw need no introduction to *Acorn User* readers and this latest book is written in their usual thorough but easy-going style. Basically a rewrite of their book for the Beeb, it is aimed squarely at the newcomer to machine-code.

The first two chapters explain how the computer works at machine-level, and the next three introduce the assembler at its simplest level, followed by a summary. Chapters 6-10 go on to more complex functions, again followed by a summary. Chapter 11 brings the whole thing together, chapter 12 deals with interrupt handling, and chapter 13 rounds off by showing the stages in developing a complete program – a text editor, in this case. The book ends with set of useful appendices and an index. Throughout there are example programs, diagrams and cartoons.

The book contains one or two small mistakes, but nothing worth worrying about. Two things I would like to have seen are a note about 'modulus' effects, when indexing with the X and Y registers, and a note about the 'bug' common to all 6502 processors, which can cause indirect jumps to be incorrectly handled. These are, however, minor criticisms and I commend this book to anyone (not just Electron users) who wants an easy introduction to machine code. **Barry Pickles**

DATABASE GEM

'Databases in the Classroom', Derrick Daines, Castle House Publications, £6.95

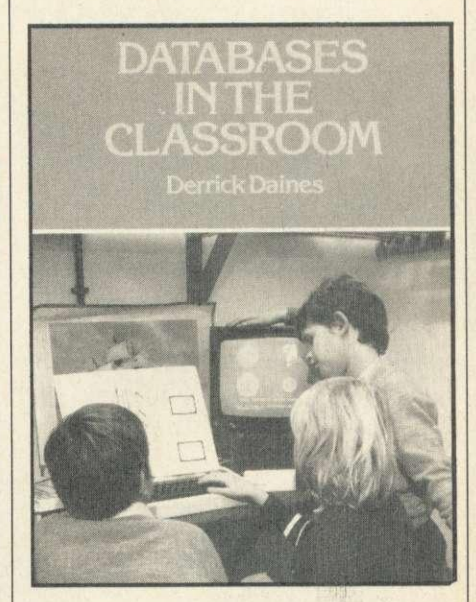
A WHOLE book for databases in the classroom? That might be the first reaction of most teachers to this book's title, if not indeed 'What's a database?' So some words of explanation are called for: Logo, simulation programs and other educational software are all very well in the classroom, but it is not how children will use computers when they grow up. Boring it may be, but most computers process data – vast quantities of it – held in things called databases. So it's important that tomorrow's generation should know something about how databases work.

The scene is set in the first chapter for today's information society and how it has arisen. As illustration, the story is told of how IBM, the world's largest computer company, grew out of a competition held by the US Government when it could no longer cope with the sheer quantity of census data. This deluge of data doesn't trouble just governments; anyone who has got lost inside the Prestel database will recognise the problem. Today it is no longer a question of what you know but rather knowing how to find out. This skill is something we should all acquire and the process should begin at school. This is Derick Daines' argument and the basis for his book.

Subsequent chapters cover the technology of databases and data management: storage media, serial and random access, bubble sorts and the like. To the novice the jargon can be daunting, but here the author introduces buzzwords only when needed.

Being aimed at teachers, the book contains several practical exercises to work through with schoolchildren, using both manual and computer methods. A simple manual system is described which uses punched cards and knitting needles to store and retrieve information on pupils – height, age, number of sisters and brothers, etc. As an example of a computerised system, the database programs in the Microprimer software pack and their possible applications are described. As this software is available free to primary schools, it makes sense to base the examples on this rather than on an expensive machine-specific commercial program.

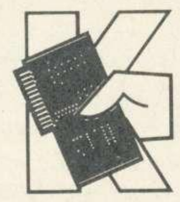
As if writing a book wasn't enough,



Mr Daines has also written his own database program for the BBC micro and a listing of this appears on the back pages. Written in Basic, it is nevertheless quite sophisticated, allowing up to 1000 records and using both serial and random access methods. Typing in long, dense listings is not everyone's idea of fun, so the program is broken down into separate sections, with accompanying text explaining exactly how each section works. This means it can easily be altered to suit your own needs. At £6.95 the book is worth buying for the database program alone!

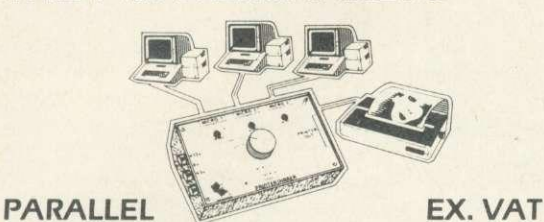
Overall, an excellent book which covers a subject not normally dealt with in most schools. If you are a teacher using a BBC micro and you want to give your kids a taste of how computers are used in the real world, this is the book for you. **Geoff Nairn**

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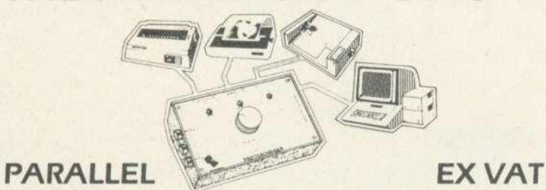
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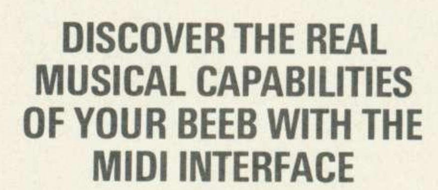
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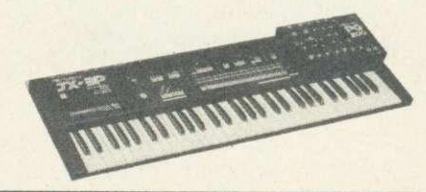
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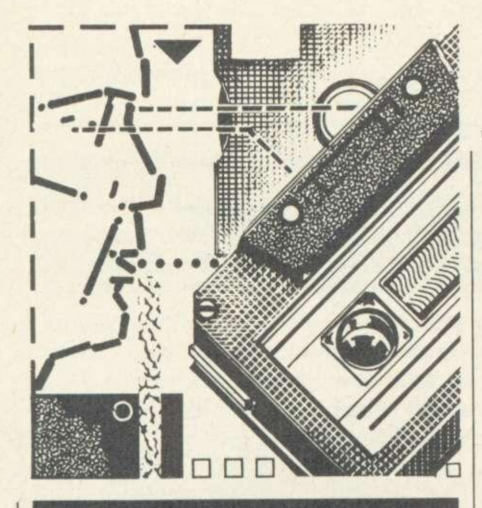
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OILY CHOICE

'Slick!', BP Educational Service (01-920 8985), BBC A or B, tape £18 (education price £11.95).

WHEN it comes to their public image, no-one is more sensitive, or tries harder, than the multi-national oil companies. Tigers, free tumblers and sponsored art exhibitions have all been used to clean up the image of what is inherently a dirty product. BP bring the idea bang up to date with *Slick!*, a 'conservation game' for the BBC micro, in which the object is to minimise the effects of an oil slick at sea.

You are Mr McTaggart, the local pollution officer for a small Scottish fishing village, with £5,000 to spend on anti-pollution methods. On the screen is a map of the harbour and the surrounding area, with the oil slick shown as an ominous black blob moving inexorably



towards the shore. Also shown are the shellfish beds, fisheries and beaches – which, above all, oil should not reach.

The game has two parts: first you decide which anti-pollution method to spend your money on – absorption, sinking, dispersant or shore-cleaning; then the action proper starts. After the oil spill has been announced, the current position of the slick is shown as a map reference, eg, (590,370). You then have to calculate its next position from the speed and direction of the prevailing wind. For example, a 'fresh breeze from the east' will blow the slick three squares to the west. If you guess right, and within the time limit, you can load up a tug with your chosen anti-pollution material and head off for the slick, moving the tug with the arrow keys.

The above process has to be done in several stages, but once you've reached the slick, you can start unloading the material and so reduce the size of the slick. In addition, you can position static booms across sensitive spots such as the harbour; unfortunately you can't see them on the screen – they appear just as map co-ordinates.

And so the game continues until, inevitably, oil reaches the shore. You are then scored on how successfully you dealt with the slick: from a base score of 50, points are added for correctly predicting the slick's path and protecting the harbour, but are deducted according to how much reaches the shore.

Here one must question BP's objectivity: for example, letting the oil come ashore loses points because, as the guide lets slip, oiled beaches get reported in the press. Similarly, shellfish contaminated with dispersant chemicals don't improve BP's image.

The final section in the user guide, entitled 'Point of Exercise', is perhaps the most telling: 'Nobody wants oil pollution. But we all need oil . . . Accidents will happen'. Oh yes?

Incidentally, with all the current talk of software pirates bankrupting the industry and the devious devices adopted to prevent it, the attitude of BP in this respect must seem puzzling, if not embarrassing. Not only are you encouraged to make back-up copies, but there is even an option in the main menu of *Slick!* that automatically transfers the program to disc for you!

As a piece of educational software *Slick!* teaches a variety of skills, from decision-making to map-reading and grid references. The danger is in thinking that a poor score means that you 'lost' – it just means that you didn't choose the method that BP wanted you to choose. Perhaps the Friends of the Earth should bring out an alternative version of *Slick!*

Geoff Nairn

SCHOOL TESTER

'The Examiner', Acornsoft, Model B, tape £9.95

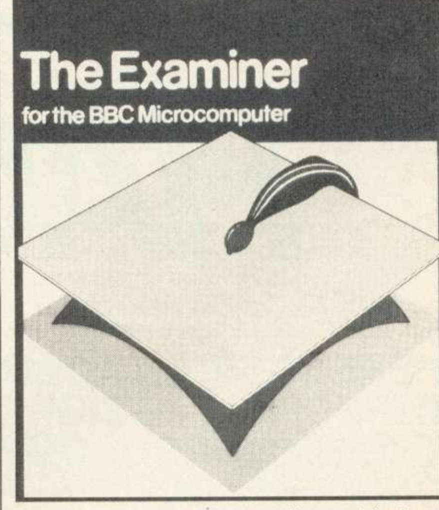
ACORNSOFT is not the most imaginative of software houses, and this especially shows in their range of educational software: elementary maths programs, simple science experiments, and now multiple-choice tests. *The Examiner* lets a teacher design a multiple-choice examination 'paper', in which the computer displays the questions, stores each pupil's answers and produces a table of scores for the whole class.

On first running the program you enter the date and are then presented with a menu of commands. Only the teacher should see this, for one option displays the answers along with the questions. Others let you load or save a set of questions on tape, enter new questions or run the examination.

If it's a new examination you select the 'enter questions' option and supply a title for your question paper. Up to 40 questions can be set, each with up to four possible answers, only one of which can be correct.

Assuming you have some questions in memory – a sample data file of general knowledge questions comes on the tape – the examination can be run. Just before this the teacher chooses how many questions to use, whether to have time-limits and whether to use sound effects. The only purpose the latter serve, being reminiscent of a motorboat engine, is to get the hapless candidate flustered.

The computer is now turned over to the children and from this point it does a passable imitation of Fort Knox: no amount of mischievous key-pressing will retrieve the menu and the all-important answers. Pressing BREAK or



ESC has no disastrous effect – it's just interpreted as a wrong answer, though CTRL-BREAK will inevitably lose the data.

As each pupil finishes the paper his or her score is stored in memory and when the whole class has finished the teacher can, by the use of a password, see the scores for the whole class. Up to 40 pupils can be examined this way; if the class is larger the paper can still be set, but the scores have to be written down as each pupil finishes.

Overall, the program works well; a lot of thought has gone into making it easy to use, while at the same time making it tamper-proof. The question must be asked, however, as to whether using a computer to set multiple-choice tests is a suitable use of a scarce resource.

Geoff Nairn

MAILBOX MODIFICATIONS COME IN ANSWER TO A JOURNALIST'S PRAYER

Bill Penfold revels in a unique combination of programs for serious mailbox users

'Auto-Message' Micronet enhancement by Alan Wilmshurst, Summerhill, Coopers Lane, Crowborough, E Sussex (tel: 0892 662956), tape £6.99

IF I WAS still saying my prayers at the foot of my bed it would be only fair to put in the occasional good word for a programmer down in Sussex called Alan Wilmshurst ... after all, he came up with the answer to my prayers.

You may recall that last August I was describing how Prestel's mailbox might be the answer for those publications needing some system for receiving copy from its journalists but for whom the expense of a mainframe computer couldn't be justified. I was already filing copy on my Beeb to the medical magazine *Doctor* which puts out its own Prestel magazine. The only problem was that I was having to compose each mailbox frame on-line. Those familiar with mailbox will know that this is both time-consuming, ties up the telephone (and so is expensive), and trying to edit mistakes on-line is far from easy.

Since then I have seen a number of methods for composing mailbox frames off-line. The way many BBC



users on Micronet are familiar with is the Micronet ROM which both does away with the need to load the terminal software and enables frames to be prepared. However I am far from impressed, either by the ROM or its mailbox editing facilities. The answer for my money is a combination of programs devised by Alan Wilmshurst. Both of his programs enable up to 20 mailbox frames to be prepared off-line and held in the computer's memory or saved on tape or disc. Pages can be just normal white type on black backgrounds or coloured type with graphics.

The software, called *Auto-Message*, is adapted from Micronet's version 4.0, to enable frames to be downloaded one at a time, plus one or two other neat refinements which make me prefer loading his enhanced software to the instant ROM. But more of the terminal software shortly. First, let's look at the message composer and its features.

When first loaded the program begins by asking whether you will be working with old pages (frames stored either on disc or tape or already in the computer's memory). Pressing 'N' immediately clears the computer's memory. Next, you are asked how many indents you want at the beginning of the first line of the frame. Normally I put in two and for those using the mailbox response frame on Prestel page 77 that is probably the most useful. After that you are presented with a menu of five choices. The first is to prepare a frame (I'll describe how that works in a moment).

The second choice is to load previously-saved frames. If you type 'Y' for yes at the initial screen you are given an option to search for a file name. Once you have completed the frames to send, the third option allows you to 'save' the program. It starts by asking you how many frames you will be saving, and after that the file name.

The fourth option is a useful copy facility. For example, suppose you want to send out the same message to a dozen friends with only a slight difference to each, such as their names, ... 'Dear Tony ...' 'Dear Diana ...' etc. You simply prepare your master frame, say for instance on page 20, then copy it onto pages 1, 2, 3 etc, just adding the alterations to each.

The fifth option simply allows you to leave the program, after which you would probably 'load' the enhanced Micronet software.

But let's go back to the first option. You press one and return and on the screen appears the page on which you will compose your Mailbox message. But first you have to input which frame page you want. The obvious response is to start at frame one and work your way through. However, this enables you to return to a previously completed frame to check or change it.

Next comes another useful feature of the program. The cursor first shoots to the bottom of the page to allow you to put in the mailbox number. You don't have to use this but it can be handy. For instance, if you are sending a long message to the same person, say six or seven frames, you need only type in the mailbox number on the first frame and then before typing in your message use the copy facility on option four, to insert


NEWS FEATURE

Micronet and Beeb make news

Bill Penfold reports on developments which could revolutionise reporting

Flashback to the August '83 issue

the number to the next half-dozen frames. Alternatively you can temporarily leave the program through option five and set the function keys with the mailbox number to insert in each response frame in the composition.

Now you are ready to start typing in your message, and this is where anyone who has tried typing a message while on-line to a mailbox response frame will find the editing facilities a joy. You can delete letters, insert spaces, delete lines above the cursor, insert blank lines and generally use a simple word processor. The delete key works as normal, but the copy key deletes the line above the cursor, and does not close up the text.

I first began using this version of Alan Wilmshurst's program about the beginning of the year and I thought he had gone about as far as he could go: but no, a mailbox message arrived with colour and graphics. The only disadvantage to this is that the response frame is limited to just 12 lines. This can be changed, but only to 13 lines, and you then lose the colour and graphics.

Once you have composed your mailbox messages you don't necessarily



have to save the frames if you are straightaway going to load the Micronet terminal software. However, I invariably do ... just in case.

Now for the terminal software. To enhance the program to send the pre-prepared messages Alan Wilmshurst provides three separate sub-programs which alter Micronet's 4.0 version. This

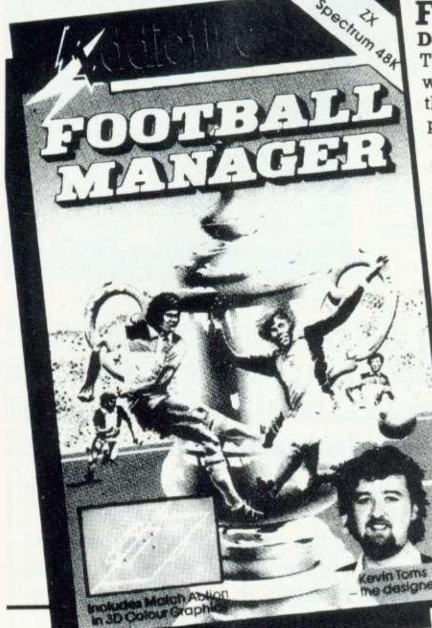
page 153 ▶

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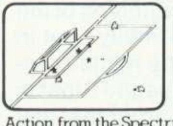
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● Matches in 3D graphics ● Transfer market ● Promotion and relegation ● F.A. Cup matches ● Injury problems ● Full league tables ● Four Divisions ● Pick your own team for each match ● As many seasons as you like ● Managerial rating ● 7 skill levels ● Save game facility



Action from the Spectrum version

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BBC Model B	£7.95
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ZX81 16K	£5.95

(N.B. 3D GRAPHICS ARE NOT INCLUDED IN THE ZX81 VERSION)

Overseas orders add £1.50

Comments about the game from press and our customers.

"FOOTBALL MANAGER is the best game I have yet seen on the Spectrum and my personal favourite of all the games on any micro . . . To the ordinary person it is an excellent view of what can be done in the field of computer games . . . The crowning glory of this game is the short set pieces of match highlights which show little stick men running around a pitch, shooting, defending and scoring . . . It is a compulsive game but people who cannot take game sessions of 9 hours or so, which happened on one happy Sunday, will be grateful to know that there is a 'save to tape' option. FOOTBALL MANAGER has everything it could . . . The originator, Addictive Games, certainly deserve the name." Rating 19/20 (*Practical Computing – August 1983*)

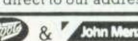
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PICTURES ON A PAGE

Dee Vince reviews three packages claiming to turn micros into electronic canvas and digital oils

Sketch Pad, Goldstar, Electron and BBC, £9.95. Paintbox, Beebugsoft, BBC (joystick only), £10 (disc £12, 3in disc £15). Picture Maker, Acornsoft, BBC, £9.95 (disc £11.50)

IT IS especially interesting to carry out a comparative review when the packages concerned all claim to do exactly the same job, in this case drawing pictures. Judging such software is difficult as there are many different criteria, so I shall try to cover all the various aspects of these programs. Let's start with the loading procedures. *Sketch Pad* has to win here for its novel title page. Part of the screen is drawn with a 'laser' light similar to the opening titles of ITV's World of Sport. It's a simple idea, but effective. Now, onto the programs.

All these packages present a blank drawing screen with a horizontal option menu. In the case of *Paintbox* and *Picture Maker* this is at the top, with *Sketch Pad* at the bottom. *Sketch Pad*'s menu displays eight colours and an assortment of drawing options, all on the one menu. *Paintbox* also has a pallette of eight colours, but with a secondary menu to cover its range of drawing options. *Picture Maker* gives the ability of using 15 colours, though when drawing only the colours of modes 4 and 5 are available. That might sound contradictory, but I'll explain it later. Let's look at *Picture Maker* first as it is the most difficult of the packages, though the most comprehensive.

Picture Maker works on two levels: a 'catalogue level' and 'picture level'. When first entering the drawing program the user is taken into catalogue level. This is a blank screen showing the number of bytes left in memory and the names of any units (picture files) which are currently in memory. From this level operating system commands can be used (as well as all disc system commands), and the commands which manage the program's system for naming units, saving and loading, changing screen modes and displaying the current picture.

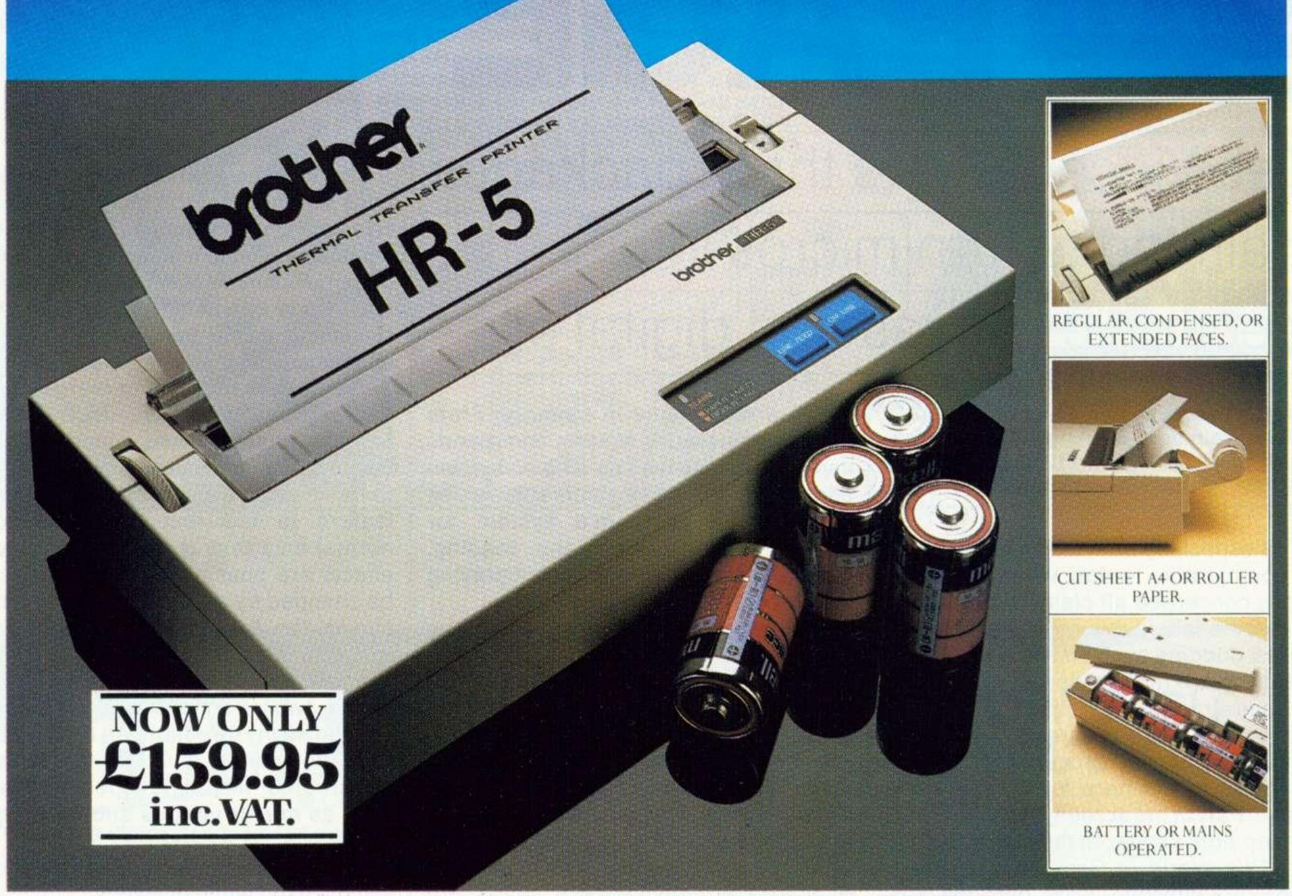
The picture level is where the drawing takes place, starting off with a blank screen and a menu at the top which says which drawing option is being used: line, text, triangle, etc. In common with the other packages the colours are displayed in a strip, but here *Picture Maker* does differ. As mentioned earlier, 15 colours are available, but not when drawing. What happens is that the extra seven are repeated in the colours of the present screen mode along the strip of pallette colours. Confusing? Well, it is! However, it does actually work as the drawing recorded on file contains the colours the user specifies, not those available when drawing; so when the picture is redrawn the full range of colours is shown.

This is somewhat unfriendly and perhaps another method, such as naming or specifying the number of a colour, would have led to less confusion. But to be fair, *Picture Maker* is a superb package and is easily the best of the three reviewed. It is also the most difficult, but worth the extra effort. *Picture Maker* allows the user to merge different pictures together, each picture being a unit, thus the reason for the catalogue level displaying the different units in memory. Another extensive feature is the text mode. Besides normal size text, a number of special effects are possible. The text size can be changed by a 'transform' option that allows the text to be expanded and rotated. The shape of the text can be changed by altering the scale of the letters in two directions and text can be spaced in any direction. All these transformations allow a variety of effects to be created including special effects such as mirror images and italic typefaces.

The transformations mentioned can also be used while drawing and allow powerful manipulation of a picture unit.

Example from Picture Maker

Little Brothers should be seen but not heard.



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BATTERY OR MAINS OPERATED.

A maxim which eloquently describes the Brother HR-5.

Less than a foot across, it's nonetheless loaded with features.

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There's one thing the HR-5 won't give you.

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Incorporating either a Centronics parallel or RS-232C interface, the HR-5 is compatible with BBC, Spectrum, Oric, Dragon, Atari and most other home computers and popular software.

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Another feature allows a shape from a previously drawn unit to be taken out and merged into the current picture.

Producing standard shapes is straightforward and requires only choosing the appropriate drawing mode. All three packages have circles, triangles and lines and involve a few easy steps. There is much to cover in *Picture Maker* and I have only pointed out a few of its features. The normal drawing commands are all present and I'll return to the rest of the package shortly. But now to *Paintbox*.

Paintbox can only be used with joysticks, unlike the other two packages. Options are chosen from one of two menus by just touching the appropriate menu option with a cursor and pressing the fire button. It is certainly easy and fixing standard shapes is no problem. Eight colours are used, though by using the 'in-fill' option a ninth colour, which is a mixture of two others in a striped effect, can be created. *Paintbox* also has a feature I like that is lacking from the other packages, namely co-ordinates of the cursor on the screen. It does, however, only work in one of the 'brush' sizes. That point neatly raises the use of different brush sizes, eight in total, with the option of a ninth variable size chosen by the user. This is done by setting the brush size equal to the length of a drawn line.

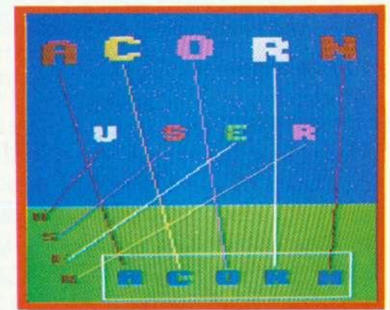


Picture Maker

The erase option is merely a clear screen facility and changes the background screen to the currently-defined brush colour. This makes erasing part of the picture difficult and means trying to erase your mistake by redrawing in the background colour (though this is not covered in the manual). *Paintbox*, in common with *Picture Maker*, makes use of the GCOL command. This gives a number of effects to choose from and controls the way in which a colour is placed on the screen. This means the plotting of colours can be as specified, OR-ed, AND-ed, EOR-ed or have the colour already there inverted.

The secondary menu allows the choosing of the eight brush sizes and the size of text relates directly to the size of the brush. *Paintbox* doesn't have the range of commands of *Picture Maker* but is easier than the other packages initially, although it does require a joystick.

Finally, *Sketch Pad* from Goldstar. It was the cheapest of the packages – and the most attractive on first sight. Boxed in a video case, it is well-presented and is provided with a separate list of commands card and a colourful 21 page manual. Options are chosen by pressing the keys usually in conjunction with the control button. Out of the three menus I liked this one the most. The pen up/down indicator for instance is a picture of a pen nib either in the air or on the paper. The range of commands is limited to the standard commands (line, triangle, circle, etc) with little scope for the added effects of the other two packages. Text can only be entered in one size and as with *Paintbox* there are eight colours with an extra colour available, which is a mix of two colours in one of three effects – chequerboard, striped, or horizontal stripes.

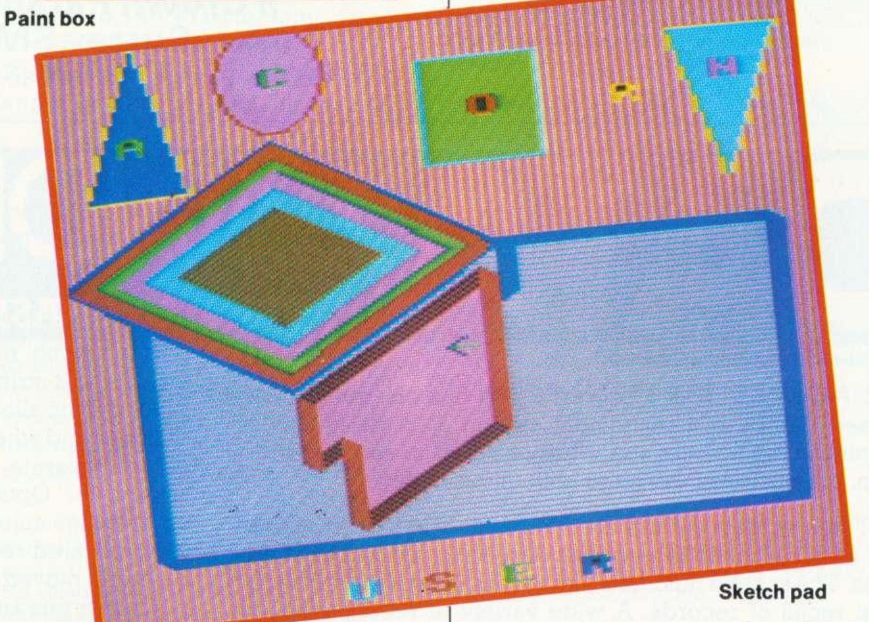


Paint box

Sketch Pad provides a potentially good command not implemented in either of the other two packages, a magnification function. This allows the user to enlarge an area four times its normal size for easier correction. Although the area is limited, this is a worthwhile addition.



Paint box



Sketch pad

Having briefly covered the main aspects I'm now going to turn to the

page 153 ▶

Package	Prices	Entry method	Machines	Summary
Picture Maker by Acornsoft	£9.95 cassette £11.50 disc	Keyboard Joystick	BBC B	Easily the most sophisticated, but can also be complicated
Sketch Pad by Goldstar	£9.95 cassette	Keyboard	BBC B Electron	Excellent packaging and presentation; very attractive to children
Paintbox by Beebugsoft	£10 cassette £12 disc £15 3in disc	Joystick	BBC B	Easiest to use, but if you haven't got joysticks . . .

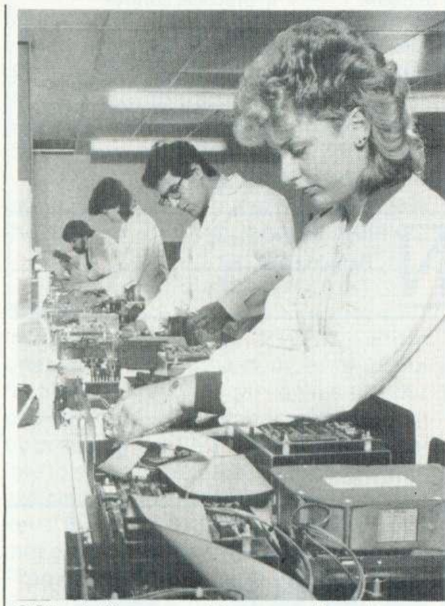


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COMPUTING NEWS

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GSL Winchester Hard Disk System for the BBC Micro
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GSL staff are working overtime to meet the still increasing demand for their Winchester Systems.

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As leading suppliers of Winchester hard disk systems for the BBC micro, GSL has consistently improved both the scope and quality of its products. Since the introduction of the first 20 MByte, 8″ Winchester unit at the start of 1983, the range has expanded to include 5.25″ drives from 5 to 116 MByte, tape streamers, a comprehensive Winchester Filing System (WFS) and a flexible networking system.

A new addition to this product list is a removable cartridge drive. This is half-height mini-floppy size. The cartridges themselves are less than 4.5″ square, and contain 5 MBytes of information. The units are front loading, cartridge replacement being performed in a matter of seconds. Cartridge drives may be used in their own right for stand alone systems, or can be integrated into a system with a large, fixed hard disk for back-up purposes, providing an economical alternative to a tape streamer.



The New Streamlined Winchester System.



Winchester Disc Drives are put through a 24 hour intensive test programme prior to despatch to customers around the world.

All Winchester systems are fully cased, and self contained, the only connection required, apart from mains, is to the 1MHz bus connector of the BBC micro. The WFS or network (E-Net) firmware is supplied on Eprom. Fully rack mounted systems may also be provided, and other facilities available include a real time clock, and a link board for connecting two micros to one Winchester system.

New Winchester Backup Facilities

Backup of the E-Net fileserver Winchester has up to now been limited to selective transfer of user areas to floppy disk. In order to augment this, the following facilities are now (or shortly will be) available.

(a) Backup of user attributes to floppy disk. (Available on application)

(b) Full backup of the filesaver drive to a second (similar) Winchester unit. (This should be available within few weeks)

(c) Full backup to removable cartridge drives. At present only 5 MByte units have been evaluated, necessitating the use of two cartridges for backup of a 10 MByte Winchester. (Expected availability is 1 to 2 months)

(d) Full backup to tape streamer (20 or 45 MBytes). (Expected availability is 2 months).

Existing single Winchester systems can be upgraded to contain backup units for any of options (b), (c) and (d), additional hardware being accommodated within the current casing. At present the most cost effective solution for pure backup purposes is likely to be option (b), with (d) the most costly, though in the latter case some improvement is hoped for before the end of the year. Prices are available on application.

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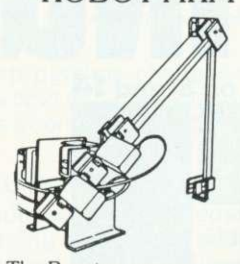
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ROBOTICS

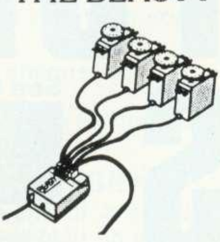
ROBOT ARM



The Beasty arm mechanism is driven by the Beasty and three servos, the result being a three axis robot arm. The arm uses a hook to manipulate objects although a gripper can be made by using a further servo. This versatile arm has been designed with enthusiasts and schools in mind although where it will end is anyone's guess!

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THE BEASTY



The popular Beasty interface connects directly to the BBC Microcomputer which enables the computer to accurately control up to four servo motors. The Beasty comes complete with all connection cables, a demonstration program and comprehensive instructions.

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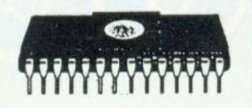
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The SJR2 Mains Controller gives you safe, low-cost control of two 13amp mains outlets. Each outlet can be independently switched from Basic. There are lots of applications from security to home appliances, so put your Micro in control . . .

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The Control ROM provides an extension to the BBC Machine for control applications. It's an essential tool for anyone teaching computer control technics, or who wants to use the computer in practical control applications. The process of sending signals to control devices is very crudely handled by most micros and the Control ROM changes this.

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★ Detailed User Guide: sections on program use, astronomical nomenclature and positional astronomy, formulae used, fully annotated expanded program listing, etc., etc.
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'SKY-BABY' package, consisting of C10 Cassette containing three files (program itself, stellar library, auxiliary program), and 35-page User Guide **£12.50** inclusive

NEW: Instructions for disc running, and running on Electron available on request.

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STOCK CARS

ON THE GRID

'Stock Car', Micro Power, BBC B, £7·95

THE object of this game is to drive a stock car round a circuit chosen from six different circuits.

The computer controls three other cars to get in your way or, on an optional two player game, it controls two cars, making a total of four cars on the screen at any one time.

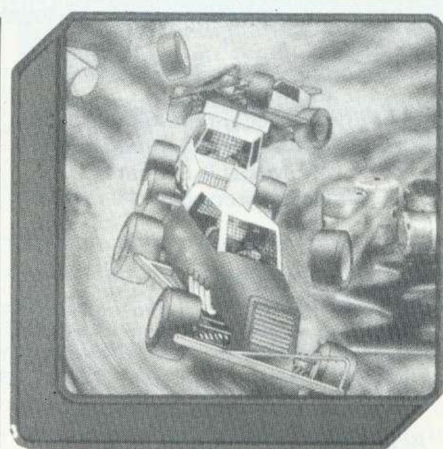
On starting, the computer plays a short tune, the engines start, and you're off! You must change into first gear from neutral going gradually through the gears, dodging the computer's cars, and carefully negotiating the corners.

The graphics are quite good. The game draws six circuits, oil slicks, and the cars, in which your car is detailed, but the computer's cars are plain. I feel the cars are a little small. I also found that if you get stopped on an oil patch it is hard to see your car, and in which direction it is pointing. On the whole though, the graphics are good – smooth, and without flicker.

The sound also is high standard. The computer plays a short tune before and after the game, you can hear the engines starting, cars bumping and the noise of cars crashing into walls. There are even two separate noises for changing up and down the gears.

This game's flexibility is excellent: You are offered one or two players, up to 40 laps to complete, optional oil slicks, variable skidding, sound on or off, six different circuits, optional joysticks, and joystick sensitivity select.

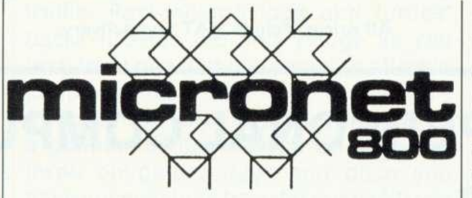
On the control side, *Stock Car* is a little hard to get the hang of at first, but it seems simple after playing for a while. Driving resembles driving a real car. The keys are very sensitive, though a little cramped (to allow two people to play at once), and it is sometimes hard to get going once crashed.



Stock Car: Good graphics and sound

Overall, *Stock Car* is an exciting, original, addictive game, with good sound, good, smooth graphics, and comes with clear instructions.

Ian Brettell



◀ *page 145*

includes an altered 'PTERM' which enables you to add a number of useful features. For a start you can insert your private Prestel ID number which is sent by pressing the TAB key. It is also possible to store three other numbers which are sent by pressing CTRL and function keys 6, 7 and 8. It is possible to use these to automatically call up particular Prestel pages, or frequently used mailbox numbers. A third option, although this would be frowned on by Prestel, would be to enter your four-character ID response as well.

As soon as you log on to Prestel you will notice something different on your screen – a stop-watch ticking away the minutes you are on line, and the hours if you are on long enough. If you want to see the seconds as well, just press CTRL f2. After being on line for seven minutes a short buzzer sounds to warn you there is just a minute to go before being charged for the next eight minutes. The buzzer sounds again after every eight minutes. For the clock alone I reckon this enhanced software beats the pants off the Micronet ROM.

The method of downloading is also fairly straightforward. You go to your mailbox response frame, say Prestel page 77 if it's just an ordinary message or page 88 if you want to send colour and graphics. The cursor waits for you to input the mailbox number. If you've already put the number into your pre-prepared page you simply press f6 and it appears. Then press f7 and the first frame begins forming, line by line on the screen. For a full 13-line message it takes about 80 seconds.

If it is all right, you send the message in the normal way, then, instead of the return key to clear the page for the next message frame, you press SHIFT f2. Now you can either send the same frame again, possibly with a different mailbox number, or you can move on to the next pre-prepared page by pressing SHIFT f7.

One day of course this form of electronic mail will seem crude and cumbersome. But it is cheap, relatively easy and available.

PICTURES ON A PAGE

◀ *page 149*

remaining parts of the packages. Redrawing a picture is often given less consideration than it should but not in the case of *Picture Maker*. Unlike the other two packages which allow the saved picture to be redrawn (*Paintbox* also giving details of the *LOAD address), *Picture Maker* includes a variety of ways to reshow a picture and provides much needed information to the more experienced computer user.

Picture Maker does not come with one program but five. There is the main drawing program Drawpic, and Showpic for displaying the pictures in any of five screen modes. Picdata converts pictures into Basic data statements for inclusion in a user's own program in a *EXEC file format, and Datapic converts this data back into a picture. There is a section on the picture memory data structure in the manual though this is not recommended for beginners! Finally, there is a screen dump facility. This, as it is covered only by an insert in the package, appears to have been an afterthought, but an excellent one it is. From either Drawpic or Showpic a picture can be dumped to disc or tape and then recreated on screen immediately. Reloading a screen dump can either be implemented by the *LOAD command or by using the Restpic program provided.

The manuals with the packages are good overall. The *Paintbox* manual covers everything, while the *Sketch Pad* version is bright, colourful and extremely friendly. Contrasting with this is the *Picture Maker* manual which runs to 43 pages and is very comprehensive. The overall impression I gained from these packages was that the quality was of a high standard.

However, *Picture Maker* is without a doubt the most advanced out of the three. It's capabilities far outstretch the others, but it is also the most complicated and this must be taken into consideration. For completeness, though, my vote goes to *Picture Maker*.

Dee Vince

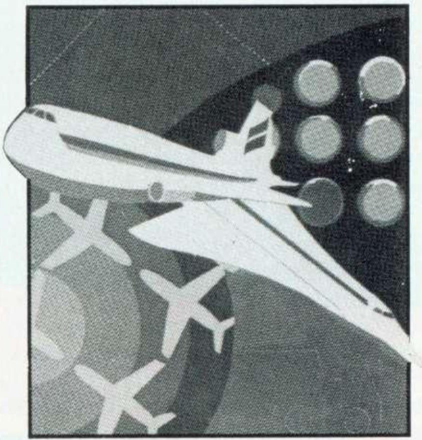
AIRLINE: OUT-LAKER THE OPPOSITION

'Airline', Cases Computer Simulations, Model A or B, tape £6.95

FROM the cover picture of a Concorde nose-diving out of the sky, you might be forgiven for thinking that *Airline* is the latest marketing twist – a disaster movie computer program! Not so. *Airline* is a business game in which, as the blurb says, the object is to be more successful than Sir Freddie Laker.

You are chairman of L-AIR, a small struggling airline with initial capital of £3 million. Within seven years – not real time! – you have to try and increase your net assets to £30 million.

At the beginning of each financial year you are presented with a graph of the forecast passenger payloads, from



which you choose the best number of aircraft to operate. For the first year of trading you don't have enough money to buy an airplane outright – they cost £10m each – and so you have to charter the required number, referring to a graph of charter rates. In more profitable years you have to decide whether it is cheaper to hire or buy aircraft, and in this case a graph of loan interest rates can be studied.

In a similar fashion the manning, maintenance and insurance levels have to be chosen: too low means some flights might need to be cancelled, too high and the cost might be crippling.

At the end of the year the accounts are closed and a balance sheet gives L-AIR's overall performance before you start a new financial year. If you lose £10m in one year, as I did, however, the receivers are called in and the company is liquidated!

A nice touch in the program is a 'ticker tape' which occasionally crosses the screen with telex messages – OPEC increase oil prices, for example. Two versions of the program are on the tape: the basic version for model A, and one for the B with graphs of interest charges and 'chairman's statements' at the end of each year.

Airline features excellent use of graphics, simple instructions and a fair degree of financial realism. It is quite compulsive!

Geoff Nairn

FROG ON THE RUN

'Hopper', Acornsoft, BBC B and Electron, £9.95 (disc £11.50, ROM cartridge £20)

HOPPER is one of my all time favourites having been around in both BBC and Electron versions since the dawn of both machines. Perhaps its popularity has been partly due to the fact that it was also one of the original arcade games that everyone used to play in pubs, clubs and amusement arcades in those pre-home computer days.

The object of the game is to hop your frog, coloured green of course, across a busy motorway onto the riverbank avoiding the crushing wheels of four lanes of congested and fast-moving traffic. Fast-moving logs and turtles' backs provide the only refuge as you leap from one to the other in an effort to jump carefully into one of the five froggy lairs. Fail at any point and you're a gonner! Of course you do have the three obligatory lives and once you have successfully transferred five frogs into their lairs they disappear at two hundred points a go.

The game restarts at this point but is of course much more difficult! This time you must avoid the snake that crawls along the riverbank, beware of submerging turtles as you leap onto their backs and look out for a hungry crocodile that moves invisibly from lair to lair!

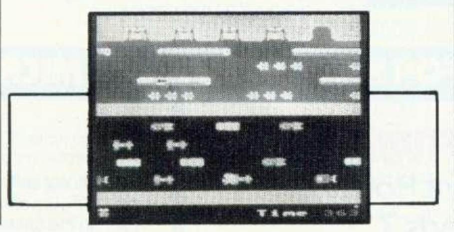
Too simple? I forgot to tell you there is a time limit to all this, a clock which counts rapidly down from 400 in about 15 seconds, if you're not safely home by then, well bye bye froggy!

Another nice aspect of *Hopper* is the musical accompaniment which sounds good even on the Elk.

A joystick is best but otherwise four keys are enough to move froggy left, right, forwards and backwards, so there are no problems with knotted fingers.

As a simple relaxing family game I reckon you can't go far wrong with this one.

Bruce Smith



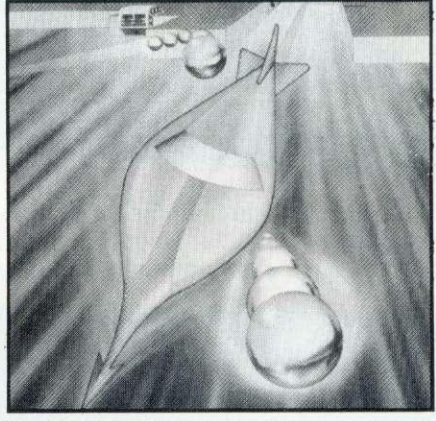
FRENZY IN THE LABORATORY

'Frenzy', Micropower, BBC B, £7.95

IN THIS game, deadly sub-atomic particles are loose in a scientific research centre. These particles are called Leptons. You must manoeuvre a robot-controlled craft around the laboratory, and trap the Leptons. The craft leaves an ion trail behind it and the area enclosed by the trail is filled in. If a Lepton is enclosed in this area, it is destroyed. You may also capture a Lepton by filling in 95 per cent of the screen. You are pursued by Chasers who follow your trail, and will kill you if you meet them.

The graphics are poor. Your craft is a square, a Lepton is a bouncing line, and a Chaser is a block. However, the movement is smooth, and without flicker.

The game's flexibility is also poor. The only option you're given is a sound on or off option. It would have been nice



to have had a joystick option, and possibly even a difficulty level.

The sound, though, is the best aspect of *Frenzy*. There are effects for starting, moving around, filling in areas, bonuses, and being killed.

The control of the program is very easy. There are five keys to operate, four for movement, and one to leave a trail. The keys are well spaced, and very responsive.

Overall, the graphics aren't up to the standard I would expect from a BBC game, with the BBC's graphics potential. Neither is the flexibility of *Frenzy*, though the sound is quite impressive, the controls are easy, and it is supplied with clear instructions. *Frenzy* isn't really original, in that it reminds me of *Demon Decorator* by the same company. Even though I am not thrilled with *Frenzy*, it has something, though I don't know what, which makes it quite an addictive game. In my opinion, *Frenzy* rates 65 per cent.

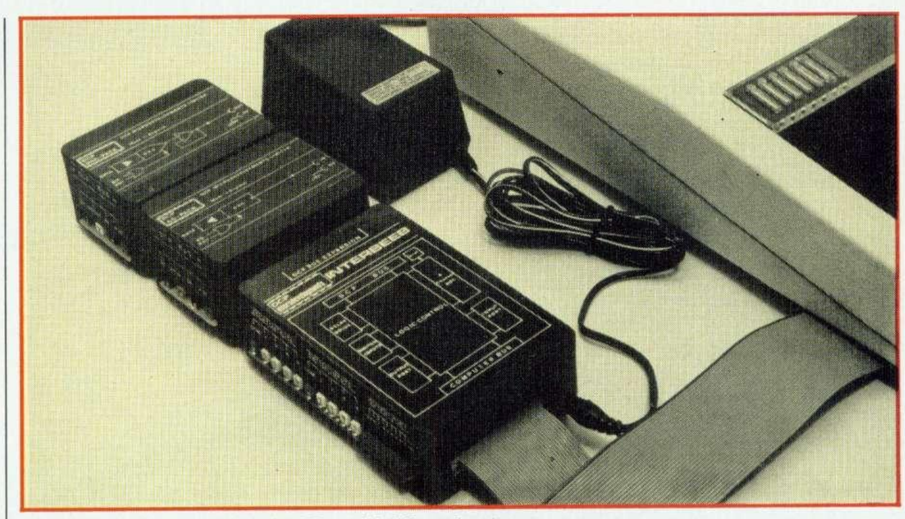
Ian Brettell

SPECTRUM OF USES FOR BLACK BOX

Interbeeb versatile interface, MCP Microdevelopments, BBC B, £69.95 (basic unit)

DCP Microdevelopments has produced an interface pack for the BBC micro which has such a range of applications that it is difficult to know where to start. Perhaps the best place is with the little black box containing all the hardware.

The black box, which measures 120mm × 80mm × 40mm, contains four switch inputs, four relay outputs, an eight-bit input port, an eight-bit output port and a medium speed, eight-channel analogue to digital converter (ADC). It also has an expansion bus which allows the use of add-on units such as digital to analogue converters and very fast ADCs.



Interbeeb with power pack, AD and DAC packs

The Interbeeb is connected to the BBC micro's 1MHz bus and is supplied with cable and a separate nine-volt power supply. The addresses used for the interface are those recommended by Acorn, the eight-bit input and output port having the same address (&FCC2)! No confusion occurs though, because if you write to the address, it outputs the data to the output port, and if you read it, you are reading the data on the input port. The voltage levels for the data are 0V and 5V, ie TTL levels. The output port will supply (source) a maximum current of 2.6mA when the output is at logic 1, but will sink 24mA when the output is low, ie logic 0.

The switch inputs are all held at a low voltage level, logic 0, by internal resistors so the user has to connect these through switches to the +5V line. The internal 5V line is terminated close to the switch inputs for easy access.

The four relay outputs are all on-board with their contacts brought out to the edge of the board on 2mm sockets. One line is common to all the relays which are each capable of switching voltages up to 12 volts (ac or dc) and currents up to 1A. The address for the switch inputs and for the relay outputs is &FCC1 with an arrangement similar to the input and output ports, ie writing to the address sets the required relay(s) and reading from the address reads the switch settings. Differentiating between individual relays or switches is achieved by the 'value' assigned to each. For example, the relays have the values 1, 2, 4 and 8 respectively, so to turn them all on, you use ?&FCC1 = 15; similarly to read the switch inputs use switch% = ?&FCC1 to store the value in the variable switch% or PRINT ?&FCC1 to display the value on the screen. If, for example, switch% = 6 then switch inputs 2 and 3 are high (+5V).

The eight-channel ADC has an eight-bit resolution and uses address &FCC0. Conversion is started by writing to this address with a ?&FCC0 = n instruction, where n is the channel number required. The data is then read by an expression such as ADC% = ?&FCC0 (or PRINT ?&FCC0), ADC% returning with the conversion value. The manual quotes the conversion time as being less than 100μs, and on the unit we had for review it was faster – 64μs.

Expansion is via the 'DCP bus' and extra units are simply plugged in. Units available include a very fast analogue to digital converter (AD-Pack) with a conversion time of 10μs which makes real-time processing of audio signals a possibility, and a digital to analogue converter (conversion time 1μs!). Also available are a connector pack for ease of connection to the DCP bus, input and output ports, and an LED indicator pack.

DCP Microdevelopments also makes an Interspec interface unit which is similar to the Interbeeb but for the Spectrum. The facilities on the Interspec are identical, and all the expansion units are cross compatible. Thus it would be possible to develop a project on the BBC machine using Interbeeb and, with the necessary modifications to the Basic program, run it on a Spectrum fitted with an Interspec pack, so you are not tying up an expensive computer for a dedicated task.

The interface is extremely versatile and sufficiently robust to stand up to the sort of wear and tear it might receive in a school laboratory. All in all, a good investment, and although it may seem a little expensive, remember that all peripherals have been affected by the recent rapid rises in the prices of integrated circuits. **Paul Beverley**

Prices including VAT (post and packing £1.95)

Interbeeb with 9V mains power supply	£69.95
Interspec	£49.95
Fast A to D pack	£19.95
D to A pack	£19.95
Connector pack	£2.95
LED pack	£0.99

For information contact: DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX. Technical enquiries should be made on Cambridge (0223) 833902 or Hemel Hempstead (0442) 64225. Educational enquiries to Griffin & George, who also supply the Interbeeb, Interspec and the expansion units.



Available to you with Nightingale, the new multi-function modem from Pace.

Nightingale is by far the most versatile modem available, at the price, for either home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between the BBC and other computers, including bulletin boards.

Nightingale will operate at both European and Bell frequencies for compatibility with CCITT and American systems.

The state-of-the-art modem chip technology employed in Nightingale requires minimal support circuitry resulting in low power consumption, low cost, high quality and extreme reliability.

Nightingale being 'hard wired' is not subject to the noise interference errors common to outdated acoustically coupled devices. In addition Nightingale features a simple self test facility for easy installation.

Nightingale utilises a fully buffered RS 423/232 serial interface and is supplied complete with a lead suitable for connection to the BBC micro, other leads are available on request.

However, in order to use such a versatile modem to its fullest potential, you will require equally sophisticated software. This is where Pace can offer you a total solution — Commstar, unquestionably the most comprehensive communications software available for the BBC.

Supplied on Eprom, Commstar is instantly accessible, simple to use and extremely flexible. Just look at the possibilities:- access Prestel, Micronet, Viewfax, Homelink and Telecom Gold, rummage through bulletin boards and chat to literally thousands of other computer users, but there's more. Commstar can be used to emulate specific terminal types such as VT 100 by means of a configuration disc, thus providing the opportunity to use the BBC as an inexpensive work station for a main frame or mini-computer.

The complete Nightingale/Commstar package for the BBC micro including the modem, cabling and the Commstar Eprom and manual is just £139 plus V.A.T. Nightingale is available separately for the BBC and other computers at £119 plus V.A.T. and Commstar is £29.57 plus V.A.T. Further details are available, please telephone or write for comprehensive fact sheets.

NIGHTINGALE by Pace
modem connect
carrier detect line hold
power/data
TX1200/RX75
RX1200/TX75
originate
answer
Viewdata
300 Baud
CCITT (Euro)
Bell (USA)

PACE

PACE SOFTWARE LTD.
92 NEW CROSS STREET,
BRADFORD BD5 8BS.
Tel. (0274) 729306 Telex 51564

This modem incorporates the very latest in communication technology and is therefore not yet B.A.B.T. approved.



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ELBUG FOR THE ACORN ELECTRON



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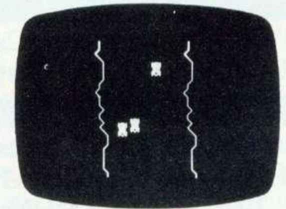
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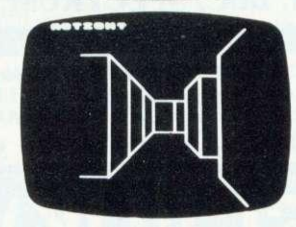
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TALK WITH TORCH

EXCLUSIVE: Alex van Someren reports on a communications pack for the BBC micro developed by Torch

FOR several years now Torch Computers has been shipping products based on the BBC micro. The company's original machine, known as the 'C' series, is a ruggedised BBC computer with expanded keyboard, Torch Z80 second processor and a sophisticated modem. Fairly soon after the C series, Torch released the Z80 second processor card in its own right, and has since shipped more than 10,000 of them to BBC micro owners.

Both the modem and the Z80 card were major selling points of the C machine, though its price of over £2,000 prevented it from selling in huge quantities. Only in the last few months has Acorn managed to get its Z80 card out, and during this time Torch has been the only consistent source of CP/M add-ons for the BBC micro. More importantly in this context, the modem was a tremendous boon to the machine. It is a Prestel-standard 1200/75 baud device with the all-important auto-dial and auto-answer capabilities.

When the C Series was launched Torch made great noises about the communications capabilities of the machine, and produced a piece of software called Torch Mail to prove it. Torch was in fact absolutely right: the machine is well suited to communications, and the Torch Mail package has been reasonably successful despite a lack of publicity. It is primarily the cost of the machine which I believe has prevented it from getting a lot of public attention, but that situation is soon to change. Torch owners can now use a major upgrade to the Torch Mail software known as, wait for it, Torch Mail Plus! And exciting stuff it is too.

'Hmmm . . . !' I hear readers saying: 'This is *Acorn User*, not *Torch User*'. True enough, and the important thing is that Torch has had the brains to offer a complete package to allow Torch Mail Plus to run on the BBC micro. What is more, it gets a new name, and properly re-written documentation. The Unicomms package, for that is it, will run on a BBC micro with dual drives and a Torch Z80 second processor (no Acorn ones I'm afraid). So the Editor sent me up to darkest Shelford to have a look at it.



Torch C series computer: first with built-in modem

The Unicomm package
Communications software (with OEL Telemod 2 modem) for a BBC micro fitted with the Torch Z80 pack:

Uniview: viewdata terminal program
Uniterm: electronic mail terminal program
Unimail: computer to computer program

Unicomm

The Unicomms package consists of an OEL Telemod 2 modem (no auto-dial or auto-answer, but more on that later), a lead to connect it to your BBC machine and three pieces of software with associated manuals. As I said above the manuals are genuine re-writes, rather than daisy-wheeled versions with every occurrence of 'Torch' replaced with 'BBC micro', which makes a pleasant change. The software is nothing short of gorgeous: just what the doctor ordered with menu-driven controls, pop-up 'Help' windows and screens that change colour to tell you what's going on.

Uniview

Uniview is a viewdata terminal program (ie Prestel, Micronet, etc) which does everything possible for you. It opens up with an 8-column menu of host computers (by name) and switches to mode 7 when you go on-line. While it can remember telephone numbers for you, it cannot dial them, so after prompting you with the number of the selected host it waits for a carrier tone on the line. After that Uniview will log you on automatically from a stored sequence that was entered previously and which it has saved to disc.

There isn't much you can say about a Prestel terminal in terms of how it looks: pretty standard stuff. Interestingly though, Torch has solved the flicker problem in mode 7 (Acorn doesn't seem to know how) and provide a control-key toggle to turn it on or off.

There are facilities for page saving to disc, happily more than one page per file, and subsequent reviewing is also implemented. Files which have been prepared off-line can be sent up to the host (useful for rude messages to Micronet) and standard format telesoftware can be downloaded to disc for future use. The text part of the screen can be dumped to a printer, but because of the variety of printers in use there is no graphics dump.

Both a Quit facility (which just 'hangs up' the call) and a Logoff command (which can be programmed to send a sequence of characters such as *90£ or whatever) are there. The Reveal function is also provided in software.

Uniterm

Uniterm is a terminal emulator for purely text-oriented systems and works within the same basic framework of menus and windows as Uniview. Several extra features such as baud rate settings are provided (not to be tried with the OEL modem though), and a Conceal key to prevent friends/family reading your password as you type it in.

Another key allows text from the host to be spooled to disc, and it appears highlighted on the screen for as long as this is happening. Alternatively, the session can be printed to a parallel printer (the RS232 serial port is already in use, remember). Files may be sent up to the host after off-line preparation, and Telecom Gold users will probably understand what a boon this is.

Again, both Quit and Logoff functions exist, saving time and trouble if your route to the host is made through more than one system.

Unimail

Unimail is the real *pièce de résistance* of this system. It is a highly sophisticated electronic mail package and contains far more functions than we have time for here.

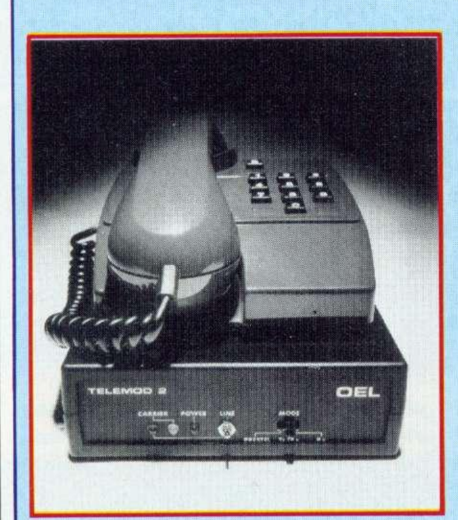
Torch Mail Plus, on which Unimail is based, is the result of about three years of continuous use by Torch and customers alike. As a result it is both versatile and easy to use. Messages and files can be exchanged between Unimail/Torch Mail/Torch Mail Plus systems by dialling them up and then getting the machines to converse in 1200baud blocks of data. The remote system can allow a variety of kinds of access to its files by means of a number of different passwords, everything from total prohibition of use, to the ability to copy files in both directions.

While there is a mind-boggling array of software switches and options, most of them have sensible default values. It is usually possible to hit the return key to set a parameter that you don't want to worry about and this makes life that much more pleasant.

Conclusion

While Uniview and Uniterm provide fairly standard features, they have been executed extremely well. Unimail on the other hand is both absolutely extraordinary and particularly well thought out. I was surprised that more noise has not been made about this package.It will cost about £180, and that can only be a bargain when you consider that the modem costs £85 alone. This product surely deserves to be a winner, and I have every confidence that it will be.

MODEM LOWDOWN

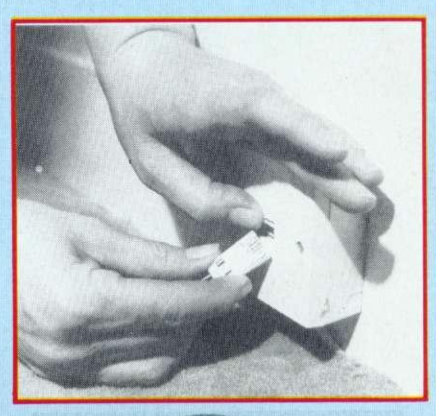


LEFT: The OEL modem is fairly typical of the latest products. The three lights on the left are: POWER – indicates the modem is switched on; CARRIER – lights up when a signal is being sent or received; LINE – when the switch is thrown, the modem is ready to receive or send.

The MODE switch chooses between: PRESTEL – 1200/75baud 'full duplex' standard for Micronet, etc; Tx/Rx – for personal micro to micro communications at half duplex. The only baud rate the modem allows is 1200/1200 for this; Rx – Receive only. Also allows the user to echo messages on the monitor.

BELOW: behind the modem. The connector from the phone plugs into the back of the modem. The lead on the right goes from the modem to the new-style BT wall socket (right). The DATA socket in the middle is the RS232 connection which goes into the BBC micro. To the left of this is the fuse and on the very left the power plug.

The RS232 connector has to be purchased separately for the BBC. OEL packages this in with terminal software for £14.95 (cassette), £18.40 (disc) or £19.95 (ROM).



Look out for this sticker (right) on any modem that you buy – it's the official BABT-approved sticker, and any modem without it cannot legally be used on the telephone system.

APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

B.T. Approval No. S/1399/3/D/021907





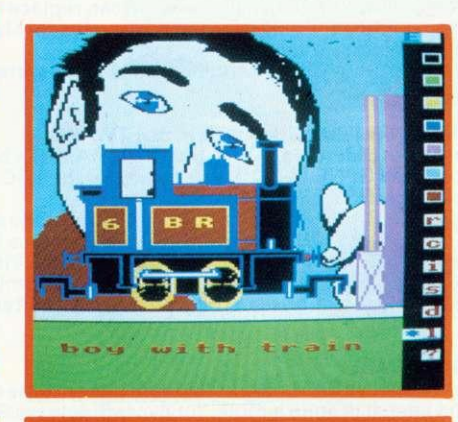
'Almost the real thing' by Malcolm Banthorpe. Because Malcolm is now a regular author – and has won a prize in Micro Gallery before, we've had to exclude his entry. However, we've printed it because it shows what's possible if you try.

Malcolm started with a wire-frame cylinder drawn at a suitable orientation on his own software. This wire-frame structure was used as a three-dimensional grid for superimposing the lettering and other surface detail with a Graphpad graphics tablet.

An ellipse-drawing routine was used to achieve the curves of the lettering. Highlights and shading were added by the Graphpad with Gaelsett's ECFG program.

READERS' PICTURES

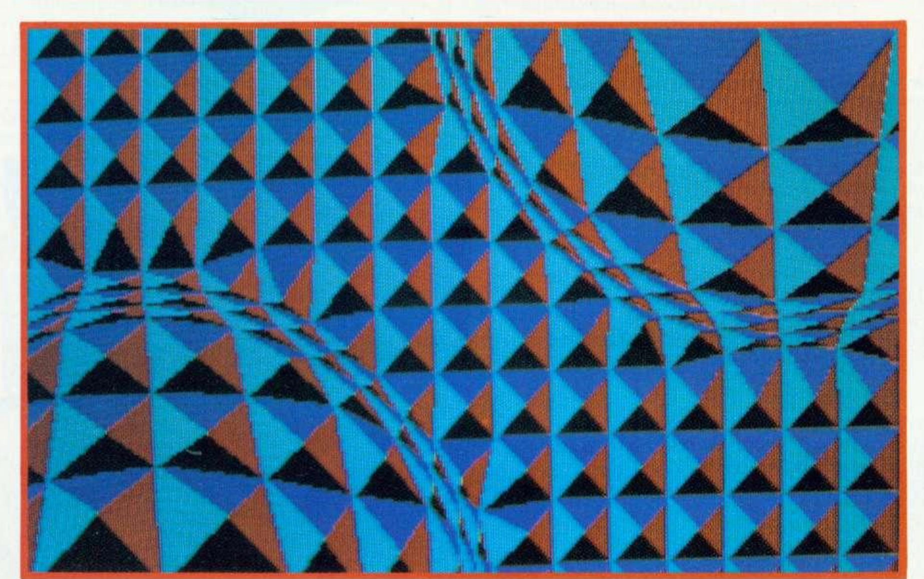
MICRO GALLERY is an occasional feature showing screenshots of graphics produced by readers. All entries printed receive software as prizes. There are few rules, but entries should be provided on cassette or disc with a short note on how the picture was developed. It also helps us if you can provide a transparency. Send your entry to: Micro Gallery, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Please enclose a stamped addressed envelope if you want your entry returned.











1ST. Lion, Train and Cat by Ron Owen from Middlesex. Congratulations to Ron on a series of pictures – three of which are shown here. They were all plotted in mode 2 using a combination of freehand drawing, pixel plotting, colour fills and user designed graphics. Ron wrote the software to use with Joe Telford's light-pen from AU March '83.

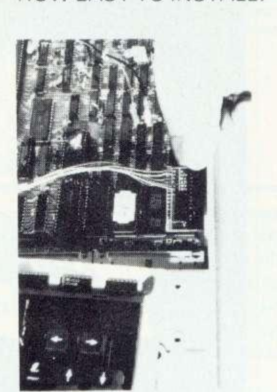
2ND. 3D membrane by Alain Noullez from Belgium. Pride of place goes to another sequence, this time showing the results of stretching a membrane by 3D objects. Alain wrote the software himself in Basic. The type and number of objects used and the membrane can all be altered.

3RD. Goblets by Ranjan Bhattacharya. This is a shot from an animated program which draws the goblets one by one and rotates them about their stems. Ranjan used a similar technique in his entry showing a rotating planet.

WHICH SIDEWAYS RAM DO YOU NEED?

Solidisk Sideways RAM is available in 16 (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208 Solidisk equivalent to 12 Sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208 is by exchange of the RAM card.

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WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

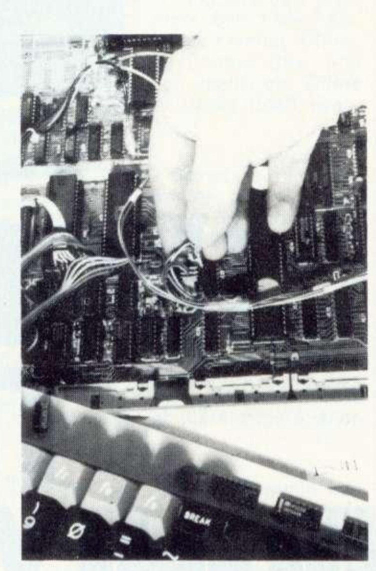
SILEXICON:
SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

PRINTER BUFFER:
PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

STLEOO:
STLOO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

STL150:
STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

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STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type *RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.



Connect the control wires

INDEX:
INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

MACRO-BASIC:
MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

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VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

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*It should be understood that we cannot put as much free software on a 40 track single sided as on 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks.
For the technical minded: the Source Code and Technical Manual (3 floppies and a 300+ page book) price = £10, the SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page mnual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00.
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16 – SOLIDISK (please return complete item)	£109.00
32 – SOLIDISK (no return necessary)	£93.00
128K – 208K SOLIDISK	£93.00
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STL55A (40 track, single sided, cased with cables, diskette, manual and 2 years warranty)	£142.95
STL55F (2 X 80 track, double sided, as above)	£232.95
STL320 (2 X 160 tracks, double sided, as above)	£499.00
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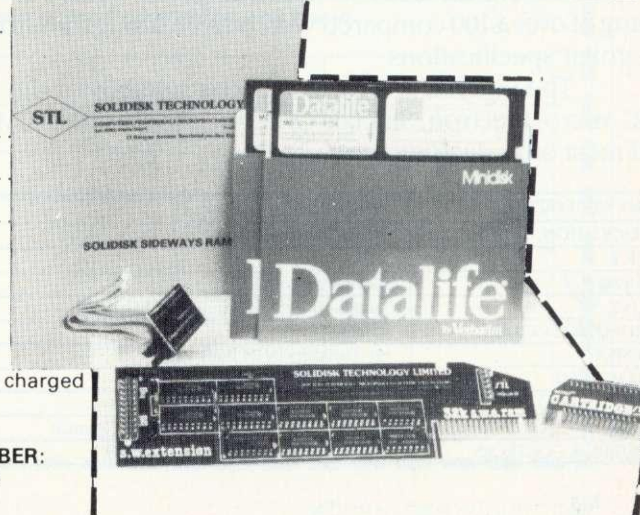
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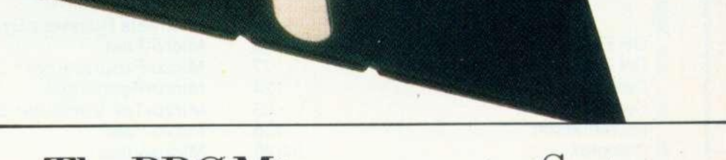
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■ **Wollensak** stereo cassette copier £900. Hardly used. Copies over 200 C12s an hour. Ideal for program producers. Phone Peter Okell on 061-736 2733 (Manchester).

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■ **Floppy** disks 5¼". Lowest prices cost/disk including VAT and p&p. SSDD: £1.50 (1-4), £1.40 (5 or more). DSDD: add 40p/disk. Cheque/PO to: Babel Ltd, 166A King Charles Road, Surbiton, Surrey KT5 9BQ. Tel: 390-2131.

■ **Spectrum** Analysis. BBC B program calculates frequency spectrum of time waveform input via keyboard or analogue port. Graphical displays. £5 cassette. D. Bonfield, 4 Marsden Way, Orpington BR6 9TX.

■ **20** educational programs in maths, physics, chemistry & geography only £8.95 (tape), £11.95 (disc). Business pack includes word processor, database, Beebcalc, VAT & accounts only £11.95 (tape), £14.95 (disk). Ranjan, Dept (AU), 3 Wensley Close, Harpenden, Herts AL5 1RZ. (48 hr despatch).

■ **Rompull** + Tapedump: £5. Super Diskmenu + EPROM version (on tape): £5. Tape2tape + Tape2disk + Disk2tape + Disk 2disc + tapedup: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. Tel: 0234-781730.

■ **Egg** the upgrade – enhances Chuckie Egg – 8 new boards – joystick routines – start at any board – up to 255 lives! £3.50 (inc p&p). Sae details to Crystalsoft, Dower Cottage, Gold Hill East, Chalfont St. Peter, Bucks SL9 9DL.

■ **Softspeech** BBC/A/B with your own voice, any vocabulary, 2secs/K, hardware included. Speech module, demos, assembly listings; link to your Basic programs. Tape £10. Opensoft, 12 Blyth Place, Russell Street, Luton, Beds.

■ **Personalise** your BBC micro. Personal message on power-up. Password (optional). On sideways EPROM. Send £15 (or £5 + 2764 EPROM), message, password (8 characters), if required. I. Whetton, 13 Woodleigh, Walton, Brampton, Cumbria.

■ **Sale:** function key definitions, 10 overlays, spiral bound. £1 each or 3 for £2. Funkey Accessories, 71 Rhydhelig Avenue, Cardiff CF4 4DB.

■ **Atom** 12k RAM fp ROM with documentation and two power supplies. Never really used. £50. Also Sony B/W for sale. Tel: 01-870-6664 (Evenings).

■ **FX80** owners. Want near-letter-quality print! Send sae for sample printout or £4 (inc.) to S. Linter, 1A Bull Lane, Boughton, Faversham, Kent, ME13 9AH.

■ **ROM** Filing System: generate your own 8-16k RFS files to run from EPROM/sideway RAM: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. Tel: 0234-781730.

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■ **Ardsoft** Educational Software announce the release of their new, quality educational software. Free catalogue and demo cassette available on request. Send 50p (p&p) to Ardsoft Educational Software, 20 Castle View, Leeds LS17 5BY.

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Hermann Hosewheel talks to our man on the Cam Orson Fact

A LIFE IN THE DAY OF A HERMANN



Millionaire entrepruner Hermann, 34, was born into the aristocratic Hosewheel family. Although the family motto is 'Ich bin nicht ein German' the Hosewheels originated in the Bavarian village of Beebonsberg before moving to Austria and wine-making. He followed a distinguished career in particle physics, discovering the atom, proton and electron. He is married to Pamela Rasp, the New Zealand bio-chemist. As yet they have no children but a very large Econet at their home in Cambridge.

"I awaken at 4.30 each morning and arise immediately. Before breakfast every day I take exercise, it prepares me for the day ahead. Some days I run only a half-marathon, but usually I run the full distance. I wave to Clive as I lap him at Grantchester.

I often fly to San Francisco for discussions at our research centre in Palo Alto. I buy California before returning for lunch with Chris.

We eat at Kings College where I did much of my research. I believe it is very important to keep up the old college ties, in fact we are thinking of buying Kings to house our growing R&D division.

Over lunch Chris and I discuss the next stage of the master plan. This is to asset-strip IBM. The two assets of value to us are their massive customer base and their worldwide chain of office blocks. We intend to strip out every installed IBM mainframe and replace it with a Beeb with Hyper-Tube interface to the Ultimate Machine (UM) that R&D are building. All the parasite terminals will be replaced with Acorn terminal emulators connected by our new Psychonet telepathic interface.

The IBM office blocks will give us the chance to diversify our operation into luxury hotels. By simply replacing the office furniture with bedroom furniture and the M in IBM with an acorn we will create in one operation the largest chain of hotels in the world. Hotel managers will come from the Product Services division.

After lunch I go to our R&D labs where I like to spend my afternoons solving the remaining problems on the AUT (Acorn Universal Tube). This is simply a high-frequency radio IO port which will interface with anything attached to a UTI (Universal Tube Interface). So on our future machines we supply just the AUT instead of the many interfaces of the BBC micro and to use, for example, a parallel printer only a Centronix UTI would be necessary.

After finishing the AUT we hold a board meeting and decide to buy some property in the City for a new London headquarters. Because we see further than the rest we agree to buy either the Post Office tower or the Natwest building.

In the evening, Pamela and I like to have a quiet night in, watching video repeats of Clive on *Spitting Images*. We are often invited to speak at official dinners, and I spoke recently on 'Acorns in an expanding universe' to the Ecological Astronomers Association. Being a bio-chemist Pamela is a wonderful cook and loves to make the traditional Austro-Maori dish Watanabe-schnitzel. Eddie the Android clears up and after playing with the Econet we retire to bed to finish the day as it started."

Next week: Christopher Wand

■THE MEP has drawn a blank with Sinclair in trying to draw up database guidelines.

Sinclair's boys are the only ones to express a wish *not* to participate, as virtue is apparently seen in incompatibility.

■MARKETING man Tom Handbay has described reports of his replacement by a graduate as 'premature'. He claims that no-one in Cambridge has yet seen a working Graduate and that his recent plastic surgery in Silicon Valley worked wonders.

'I passed my ART (Android's Reliability and Training) examinations first time.'

■*THE Oric Muser* has just announced a policy of not commenting on a new product until they know something about it. Trouble is, they need to fill their news pages.

■ACE investigative reporter Orson Fact has compiled the latest 6502 second processor league table:

China	2
India	6
Wellingborough	17 *
Cherry Hinton	293
Soviet Union	1,347,513 **

* Still in parts awaiting shipment.

** Courtesy US Department of Defense.

ACORN ABUSER'S Diary

OVERHEARD in a Cambridge tavern: 'I hear Acorn's dropped the 16032 second processor.'

'Really? What are they doing instead?'

'Something called the 32016. Apparently the same architecture as the 16032 but twice as late.'

■A RECENT collaborative venture with Acorn has enabled Commodore to release the Plus 4 computer. It will work as a stand-alone machine but it was really designed as a second processor for the Electron.

We asked Acorn's Jean Vincent when we could expect Acorn to release the Plus 2 and Plus 3 to interface with the Plus 4: 'We are working very hard on them.

'Currently, with all the add-on boxes, the machine is so deep it falls off the back of the desk.'

■THIS month's Barry Woodentop Monumental Cockup award goes to Inferior Software for their Spectrum emulator on the Z80 2P.

MD Kai Gooney commented 'We're very excited to have won this award, proving our lead in the race to turn the Beeb into a really serious machine. Our ZX81 emulator is far advanced and after that we'll announce the Oric Atmost 4.8k.'

IN NEXT month's *Acorn User* we ask:

■'Does the Z80 second processor work with Disc Doctor in the IO processor?'

■'Is Chris Curry related to Gandhi?'

■'Is Hermann really a German?'

In the meantime see if you can guess the answers from the following anagram: ON

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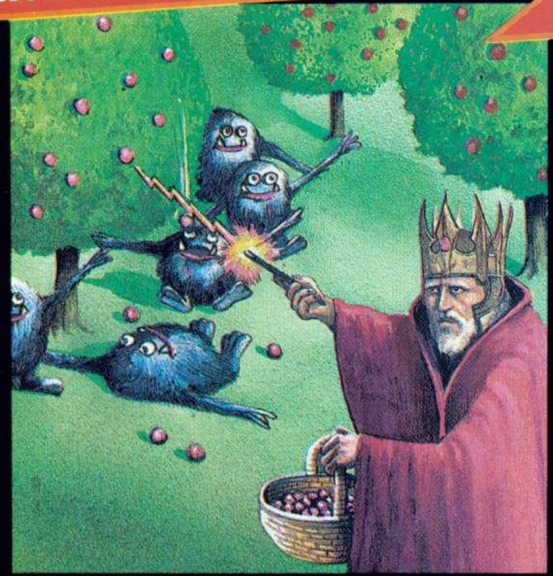




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(KEYBOARDS or JOYSTICKS).

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